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January 17, 1924

Engineering News-Record

Building Hudson River Connecting Railroad

November Typhoid Epidemic in Part of Chicago

Handling Concrete Materials in the Swiss Alps

Business and Engineering of Road Construction

Traveling Cableway for Dam Construction in Swiss Alps

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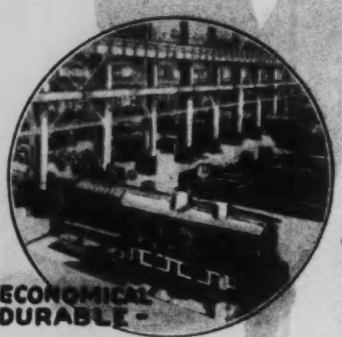

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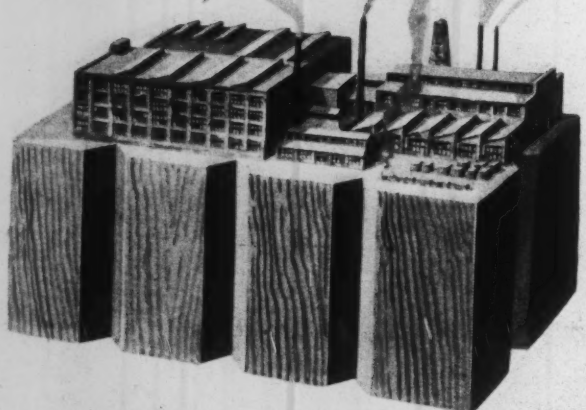

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

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FRANK C. WIGHT
Editor

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No Radical Railway Reform

IN THE nature of its make-up the Transportation Conference of the Chamber of Commerce of the United States held in Washington last week afforded ample opportunity for the user of the railroads to make himself heard. It was by no means a railroad packed organization. That it should have endorsed in most particulars the Transportation Act is therefore very significant. The meeting did not live up to the expectations of the elaborate foundation that was laid for it in any great constructive suggestions but it did confirm an already widely held impression that the major difficulties of the railroad problem will be easiest settled by the careful working out of the program laid down in the current railroad law. Before we begin to make anew let us at least approach completion of the planned machine.

More Ambiguity on Production Statistics

THE communication of the Attorney-General to the Secretary of Commerce in regard to the distribution of trade statistics, noted in our news columns, might well have emanated from Dickens' "Circumlocution Office." The distinguished Attorney-General is evidently imbued with the holy fervor of a crusader to enforce what he is pleased to call competition. By the system which he proposes a few large companies competent to maintain secret service staffs will be the only ones informed regarding the state of the trade. That this encourages centralization of power is not considered; competition outwardly at least must be maintained. Let the small fellow in the industry find out about his industry as best he can. Aside from that, if the Secretary of Commerce can tell from the Attorney-General's letter whether or not the Department of Commerce is engaging in an illegal act in collecting production statistics, he is more of a superman than his most ardent admirers claim.

Tax Exemption and Surtaxes

EXEMPTION of municipal, district, county and state bonds from federal taxation is under attack now as the chief retardant to income tax reform. Recourse to these securities by the big incomes not only deprives industry of capital but also overencourages expenditure on public improvements. Therefore it is proposed by constitutional amendment to permit the federal government to tax income from these now tax-free sources, thereby, it is hoped, curing both evils. Curiously, the proposal has advocates both among the conservatives, who hope thereby to release capital to private enterprise, and among the radicals, who anticipate an easier collection of high punitive taxes from the very rich who will not have the present tax-free haven. Both sides cannot be satisfied by the mere adoption of the proposed amendment; the real issue will come when the surtax rate has to be determined upon. But so long as tax-exempt securities exist—and in the ordinary course of constitutional amendment that will be many years—the desirability of reducing surtaxes to a point where capital is attracted to taxed issues cannot be questioned. To claim to know just where surtax rates should be placed is to assume a fiscal omniscience, but a trial-and-error method of putting them at some lower point—possibly at that recommended by the Treasury experts, possibly somewhat higher—should commend itself to every one. The tax returns for the first year after such a change would afford an excellent base from which to adjust the rate in the next year.

Making Public Work Cost More

IT IS too easily assumed that tax-exemption inevitably leads to extravagance in public expenditure, with consequent higher burden on the public. Undoubtedly the investment bankers seeking tax exempt release for funds make it easy for communities to issue bonds by offering attractively low rates. But by no means all the increase in the totals of such bonds since the war is due to that cause. Everything costs more than it did. A necessary improvement which meant five millions ten years ago means ten millions today, and the holdup of such necessary improvements during the war years requires that more has to be done each year now than before the war. So figures comparing the bond issues of today with those of 1913 are by no means a quantitative indication of extravagance in public work. It must be understood, too, that the denial of exemption to public securities is not going to work altogether in the direction of lower taxes. Doubtless it will tend to lower federal taxes, but in some degree it will raise local taxes, because it will increase the rate on public issues. Every point raise in the rate of a public bond means the abandonment of a certain number of public enterprises, which is not altogether to be deplored, but vast amounts of public work must be done, regardless of cost, and the rising rates which follow tax imposition on public issues mean just so many points added to the local tax rate. The problem of taxation is complicated; this is just one of the many elements that make it so.

Recapture of Excess Earnings

NATURALLY the prosperous railroads hoped that the Supreme Court would declare the recapture clause of the Transportation Act unconstitutional because its operation will prevent them from reaping the full benefit of their strategic positions or businesslike operation. Yet in the long run, the declaration of its constitutionality may be a blessing in disguise, for the declaration will not only help stabilize the Transportation Act but will also make it more difficult for the advocates

of its repeal to prove their case against it. As it now stands the act does not guarantee a return to any road but does place a responsibility on the Interstate Commerce Commission to see that the weaker roads earn a fair return on their investment. Without the recapture clause such a provision meant that the strong roads would inevitably earn an excessive return on their investment. This was the cry of the anti-railroad groups in and out of Congress. Without the recapture clause their argument has a good foundation; with it it has none. If the railroads want the Transportation Act to stand, and we believe they do, then they should accept this decision of the Supreme Court as a defeat for the anti-railroad groups and should bend their efforts toward convincing the Interstate Commerce Commission that the maximum return now set, 5½ per cent, is not sufficient for them to raise new capital, rather than toward obtaining amendments to the act which would eliminate the recapture features.

Hope for a Public Works Department

NORMALLY it would be too much to expect any reorganization of the government departments in the last year of an administration, when cabinet officers have become wedded to their bureaus and Congressmen are casting fearsome eyes toward the next election. And yet the prospects today for a new federal department of public works are bright. Partisan measures can hardly be forced through a congress constituted with so delicate a balance of power as is this one, but a legislature, after all, must legislate, and if partisan legislation cannot be achieved there must be recourse to non-partisan and non-political. Of such is department of public works. It has been fought for by engineers for years; it has been advocated by presidential efficiency experts and by disinterested economists; it has been agreed to by cabinet officers, though last week at Washington the Secretary of War disappointed its advocates by clinging to the military control of non-military activities. There is only one powerful group in opposition—the Corps of Engineers of the Army, which still vigorously opposes the removal of the river and harbor work from its long-time control. The department of public works will become a fact—and that within the life of the present Congress—unless in despair of unraveling the many tangles in the whole involved skein of bureau reassignment Congress refuses even to straighten out this single thread which lies twisted before it.

A Sore Spot in the Municipal Field

GARBAGE disposal is so very sore a spot in the municipal field today, as it has been for years past, that it demands special and immediate attention. Engineers who have devoted themselves to this subject, few indeed though their number be, are perfectly competent to design works for garbage disposal by incineration, reduction, or feeding to hogs; works that would be perfectly sanitary in operation, and that would not be an undue burden either for capital or other charges. But rarely indeed does an American city call upon an engineer to advise it what method of disposal to adopt, much less to draw plans and specifications, let contracts, supervise construction, test the plant on completion, and last but not least, put and keep the completed plant—be it incinerator, reduction works, or piggery—in the hands of a competent engineer for operation.

The net result of all this is, as has been repeatedly pointed out in these columns, that the country is dotted with abandoned garbage disposal plants. Plants are built only to be shut down within a few years or months, and some are never put into operation.

Reform in garbage disposal cannot be expected until it is borne in upon the average city father and citizen that the service is engineering in character; that each city is a law unto itself as regards the best method of disposal to adopt; and that the best method cannot be chosen except through careful engineering study, which will take into account the amount and character of the garbage, the layout of garbage collection routes, the cost of transportation to the disposal plant, and the kind of disposal best fitted both to the character of the garbage and to the region of which the city is a part. Rarely does a manufacturer, a promoter or a local contractor take all these things into account, while as a rule they are quite beyond the conception of the ordinary city father of today.

Much educational work will be required to put garbage disposal on a proper basis. This must be done by the engineers, but in most cases not until after a period of self education. Thousands of engineers are acquainted with at least the first principles of water supply, sewerage and paving, and hundreds are daily engaged in designing and constructing such works. The number of engineers who are equally well founded in the principles of garbage disposal probably does not extend beyond a few score, while those who are actually practicing in that field may be counted on the fingers of one hand. Recruits here are badly needed, even though the prospect of monetary reward be small and distant.

Typhoid in Chicago

DESPITE the meager and in some ways conflicting evidence and because no other explanation can be found, the only safe assumption for the Chicago authorities to act upon is that the typhoid epidemic of last November was water borne. The indications are that the supply was infected for a short time only with a heavy pollution. The chlorine dose, the only line of defense, was probably insufficient to reach all of the typhoid organisms. The less resistant portion of the population, it appears, succumbed to attack of such germs as were left. The incidence of the epidemic was light, only one case in 3,000 population, but the half million people threatened produced cases enough to alarm the officials and arouse them to preventive measures. Frankly, the three separate agencies responsible for the purity of the water supply neither operated or co-operated as well as modern sanitation dictates.

Responsibility for the application of chlorine is divided. The health officers say how much and the bureau of engineering physically carries out the orders without knowledge, at least immediate knowledge, as to the resulting efficiency. Analyses apparently have been made, largely of the treated water only, so that efficiencies could not be ascertained. Nearness to ultimate load factor with the applied dosage was therefore not ascertainable. Tri-weekly sampling of chlorinated water and much less frequent sampling of raw water which, by the few analyses made, shows "bad" are decidedly inadequate to protect such a vast population

as that of Chicago. Not all of the sewage has been kept out of the lake by the Sanitary District of Chicago, though that is its duty. Its co-operation certainly should extend to notification of the water officials when it knows that sewage is going into the lake.

What can be done to prevent a recurrence of the epidemic? That should be the subject of a conference of representatives of all the departments concerned. In view of the seriousness of this question and the uncertainty as to the mode of infection that caused the recent outbreak, outside experts might well be called in to review all the sanitary aspects of the Chicago water supply. Every one of the agencies responsible for the water supply, sewage disposal and health of the city agrees that filtration must come ultimately. Many sanitary engineers in Chicago feel that the time has already come. Without chlorination, immediate filtration would be imperative. Shall Chicago continue to neglect longer the obvious first line of defense, water filtration?

Chicago is practically the only city where the health department does more than check the sanitary operations of the water department. Obviously the bureau of engineering should itself know more about the water than anyone else—and earlier. As the State Board of Health recommends, a sanitary engineer with an adequate laboratory force reporting to him should have direct responsibility for the purity of the water. To him the Sanitary District could relay its research findings and emergency happenings. On him the health department could rely for day-to-day operation, checked by its own staff as occasion might dictate.

If the spectacle of the sixteen victims of this mass-infection epidemic arouses Chicago to the precarious condition of its water supply they will not have died in vain. The false sense of security with which the low typhoid death rate of the last half dozen years has lulled the authorities to sleep should not now be permitted to blind their eyes to the obvious necessities of modern scientific safeguards of sanitation. The health commissioner frankly states that a similar epidemic will occur again in a few years. Can Chicago afford the risk?

The Public Should Be a Partner

WHEN an engineer is engaged in spending public money in the construction of public improvement, he carries a special responsibility in the direction of informing the public and gaining its sympathy and support. This obligation, however, he forgets in many cases, to the injury of the public as well as himself. By failing to keep the public informed of his plans and the progress of their execution he withholds something to which the public is entitled and which it should have. The result of this deprivation is loss of public interest in the undertaking, which in turn breeds distrust and suspicion, and in the end brings loss of public sypmathy and the financial support on which the undertaking depends for its success.

There is an Eastern undertaking, a large piece of public-works construction involving many millions of dollars, which has been seriously set back by the secretive attitude of those who have it in charge and by the resulting indifference and hostility of the public for a good part of the long period during which it has been in progress. The undertaking depends for its success on the active support of a number of communities and authorities. In order to gain and hold such support, it is manifestly necessary that the public should at all times be kept fully informed of the work, so that every citizen might be personally familiar with the project and come to feel that it is an enterprise in which he himself is a partner. With such a sympathetic knowledge the support of the public could never be wanting, and under its influence the many difficulties, financial and other, that beset every large undertaking would dissolve.

But the course of the directors of this enterprise has been sadly out of harmony with these considerations. They have been secretive concerning their plans and their movements. Their difficulties—and difficulties were not lacking—were treated as their own private affair, and public curiosity was regarded as public intrusion. The present status of the work is that the key element of the enterprise is uncompleted, after three capable contractors tried to carry it out but abandoned it, under circumstances suggesting anything but a fair partnership between contractor and public in carrying out public work. Moreover—and this is even more serious—the enterprise is losing the faith and support of the public and is drifting constantly farther away from the practical realities of public needs.

There is an equally large undertaking in the far West, still in its early stages of construction, where the necessity of working with the public and making sure of the public's whole-hearted support and co-operation is being neglected almost as seriously, and where, if this co-operative attitude is not soon established, the result may be as unfortunate as in the Eastern case. The project is well under way, but its most difficult element has not yet been taken in hand, and the engineers are now planning to proceed with that part of the project. In the work yet to be done they face engineering difficulties of location and subsoil that make the situation most formidable. As to how these difficulties are to be overcome the public has not been informed. The engineers have remained aloof from all newspaper men and have made no effort to take the public into their confidence. As a result the work is subject to technical doubts which are more or less freely voiced in the communities whence the financial support must come. Thus the engineers risk loss of confidence of the public authorities at the very moment when they need the strongest possible moral backing to help them put through their task. The fullest success can be attained only when there is careful cultivation of that sense of co-partnership which must pervade both the public which pays for the work and the engineers who are carrying it out.

Public support does not depend upon propaganda methods. What we are suggesting here cannot be obtained by booster's propaganda or dissemination of publicity dope. It is, on the contrary, the use of such means as will give the public fullest information about the progress of the work, the difficulties encountered and the methods used for dealing with them, applied in the spirit of regarding the people at large as the partners, the financial constituency which is entitled to current accounting for the work and which must give the enterprise its wholehearted support at all times. And while our remarks apply primarily to work being done with public money, the more farsighted among the managers of private companies operating public utilities will recognize that they have almost equal application to work in their own field.

Handling Concrete Materials in the Swiss Alps

Mountainous Conditions Make Ordinary Methods Impracticable—Long Cableways, Incline and Narrow-Gage Railways Used to Reach Site—Movable Tower Cableway

By S. A. Nutter
Allied Machinery Co. of France, Paris, France

CONSTRUCTION of dams in any part of the world is generally surrounded with so many natural difficulties that the use of superlatives is usually necessary in describing them. The Barberine dam, located in the Swiss Alps, is no exception, yet the Swiss engineers and contractors responsible for its construction accept these "insurmountable" difficulties with a naturalness inherited through generations who have lived their lives in the majestic and picturesque Alps.

Within sight of Mount Blanc and coming down from the Mount Ruan glacier, the glacier des Fonds and the Tour Salière, 3,220 m. high, the Barberine River cascades its way a distance of seven kilometers and empties into the Eau Noire at the Swiss-French frontier. Four kilometers further the Eau Noire in turn empties into the Trient, flowing through the wonderful Gorge de Trient, down to Vernayaz and on into the Rhone.

The Barberine dam is a part of the general plan of

FIG. 1—DOWNSTREAM FACE OF DAM
Showing storage bins, concrete mixing plant and chuting equipment. July, 1923.

the Swiss Federal Rys. for the electrification of the railways in Switzerland. This hydro-electric installation will furnish power for the operation of the railway between Geneve, Lausanne and the Simplon tunnel, and will be placed in operation during 1924.

Two central stations of 60,000 hp. each are being provided. One will be located at the railway station of

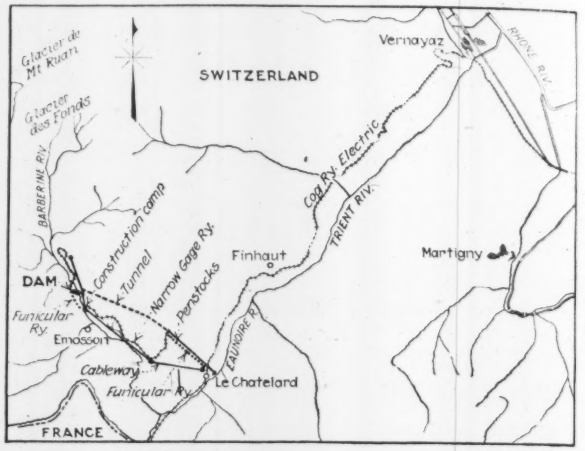


FIG. 2—MAP SHOWING LOCATION OF BARBERINE DAM

Vernayaz and will operate during the season of high water in the Trient and Eau Noire; the other will be located at Chatelard and will be operated from the reservoir to be created by the construction of the Barberine dam. This will operate during the six months of the year when the flow in the Trient is insufficient to run the turbine at Vernayaz.

The dam is of the gravity section, 77 m. (252.6 ft.) high from the lowest point in the foundation to the crest (El. 1,887 m.), arched on a radius of 400 m. with a width of crest at the center of 5½ m. reducing to 4½ m. at the ends. There will be 210,000 cu.m. of cyclopean concrete used in the construction, and when completed, the dam will form a reservoir for 36,000,000 cu.m. of water (1,270,000,000 cu.ft.). A free-flow tunnel 2,400 m. long followed by two high-pressure pipe lines 1 m. 20 cm. in diameter and 95 mm. thick bring the water to the turbines at the central station at Chatelard. The drop in the high pressure pipe lines from tunnel outlet to turbine level is 750 m.

The rock is gneiss, and while not seriously faulty, numerous glacier mills were encountered during the excavation for the foundation. The customary precautions were taken in preparing the foundation and pipes were placed at regular intervals through which grouting was forced by a grouting machine operated by water pressure. It was anticipated that fifteen to twenty per cent of plum stones could be placed in the dam, but the rapid progress of the concreting has made it very difficult to obtain more than seven to ten per cent of plums.

A thoroughly modern camp was installed at Emosson, very close to the location of the dam. Steam cooking and drying equipment, hospital, electric lighting and heating, postal and telephone service, together with the usual commissary and entertainment services have eliminated any labor difficulties. Between 400 and 500 men are employed, the labor being exclusively Swiss and Italian. The working season, during which concrete

can be poured, is limited to about 100 days, during June, July, August and September. The late snowfalls of the spring of 1922 made it necessary for the contractors to remove more than 12,000 cu.m. of snow before work could be commenced in the latter part of June.

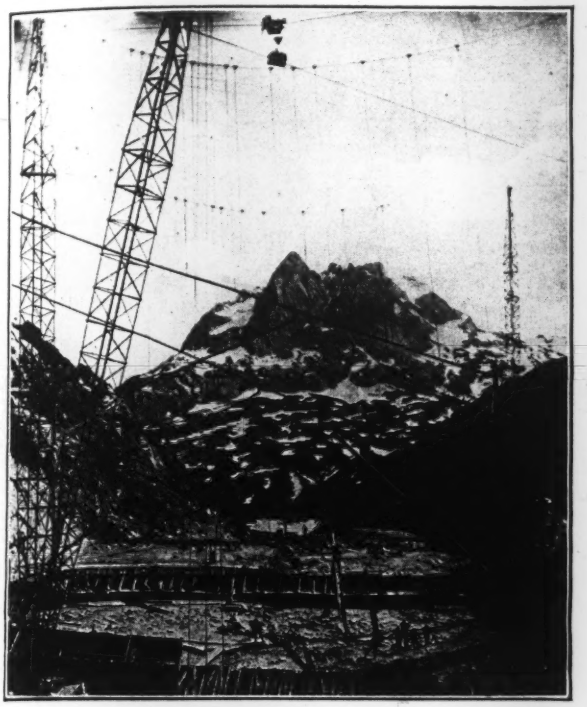


FIG. 3—EXTENSIVE CHUTING SYSTEM TO COVER WHOLE AREA OF DAM
The men in the view are wearing steel helmets to protect them from falling stone.

The camp buildings are built of cement and cinder blocks with wooden studs, the roof framing being exceptionally heavy to withstand the unusual snow load, the winter months frequently finding the buildings entirely covered with snow.

Due to the very short working season, the contractors planned and installed very complete mechanical equipment for handling materials and aggregate and for placing concrete, in order that the contract could be completed within the time required by the railway officials. The work is now ahead of the schedule, due to the thorough manner in which the construction equipment was planned and installed.

A cogwheel electric railway, narrow gage, known as the Martigny, Chatelard and Chamonix Ry., connects with the Swiss Federal Ry. main line at Martigny (El. 490 m.) and winds its way up the Gorge de Trient to the well known tourist town of Chamonix (Mont Blanc). This electric railway carried the construction materials and supplies to Chatelard station (El. 1,126 m.) a distance of 15 km. From this point, as well as from the railway station of Finhaut, laborers and Swiss guides carried the lumber and materials required for camp construction over the mountains to Emosson, a distance of about 7 km. by the mountain trails. This same method of transportation was employed for the track materials for the 60-cm. track laid from the camp site at Emosson to the dam

At the same time, the railway company commenced the construction of a funicular line from Chatelard to the intake of the penstocks or high pressure pipe line at El. 1,820, this funicular rising 700 m. in a length of 1,400 m., with a maximum incline of 87 deg. This line is a part of the permanent installation, and is used during the construction period for laying the two high pressure pipe lines, which it parallels, as well as for transporting men and materials for the tunnel and dam work.

From the top of the funicular to the contractor's camp a 60-cm. gage track was laid, the motive power being furnished by gasoline locomotives. The length of this line is 3,400 m. and it has transported all of the machinery and a good deal of the materials used in the construction of the dam. In addition to the funicular and the narrow-gage railway mentioned, the contractors constructed an aerial cable tramway from the railway station at Chatelard to the site of the dam. This line is divided into three stations or sections. The first section, from Chatelard to the camp at Emosson, 3,350 m., has a capacity of 8 tons per hour. The buckets are the friction grip type holding 350 kg. (770 lb.) and the tractor cable has a speed of 2 m. per second. This section is operated by a 65-hp. motor. The second section runs from the camp site to the dam, 340 m., and has the same capacity and speed as the first section but operates with a 30-hp. motor. The cable friction grip and an aerial switch permit the buckets to be passed from one section of the line to another. The third section of the cableway runs from the aggregate storage bins at the dam to the gravel washing and screening plant and bins, 960 m. The capacity of this section is 108 tons an hour and a speed of 2½ m. per second is employed, with buckets having

FIG. 4—MOVABLE TOWER OF 5-TON CABLEWAY

a capacity of 600 kg. (1,320 lb.). A 60-hp. motor is employed for this section. The maximum span between supports or pylons in this cableway is 640 m.

Cement is received in sacks from railway cars at Chatelard and is loaded directly to the aerial cableway.

On reaching the dam it is discharged to a cement bin holding 30 cu.m., in the bottom of which are two screw or spiral conveyors. One of these conveyors carries the cement to each of three automatic weighing machines, one of which is located directly above the batch hopper of each of the three concrete mixers. When a weighing machine is filled the conveyor carries the cement on to the succeeding machine and any excess is carried to the end of the conveyor where it is picked up by the second conveyor and returned toward the cement bin. This second conveyor, however, is also connected with the weighing machines, so that very little excess is actually carried back to the cement bin. The weighing machines used are similar to those commonly employed in flouring mills and have proven very satisfactory to both engineers and contractors, although considerable difficulty was experienced in their proper adjustment during the early period of their operation.

Gravel and sand are obtained from a gravel deposit in the river bed about two kilometers above the dam. Two ladder type dredges with a combined daily capacity of 1,150 cu.m. load the material to V-type dump cars. These are hauled to a track hopper feeding the washing and screening plant, which includes a No. 5 gyratory crusher to take care of the oversize (material larger than four inches). The storage bins at the washing plant have a capacity of 250 cu.m. and deliver the washed and screened material to the third section

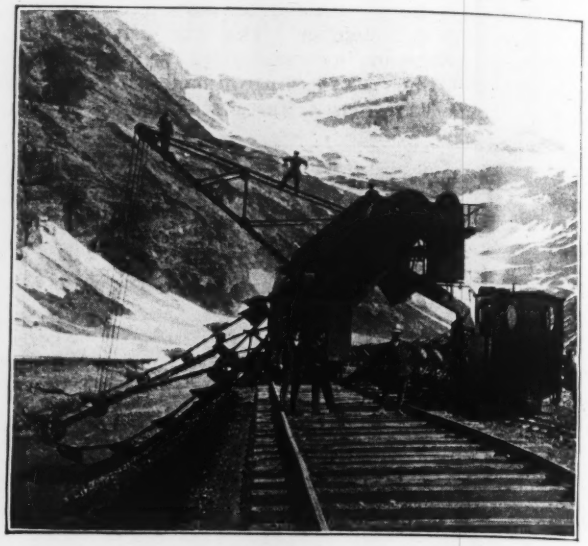


FIG. 5—GRAVEL LOADING EQUIPMENT

the masonry facing for the dam. The cableway is operated by an 80-hp. motor, has a hoisting speed of 45 m. per minute and a traveling speed of 180 m. per minute at maximum load. Two steel guy derricks with

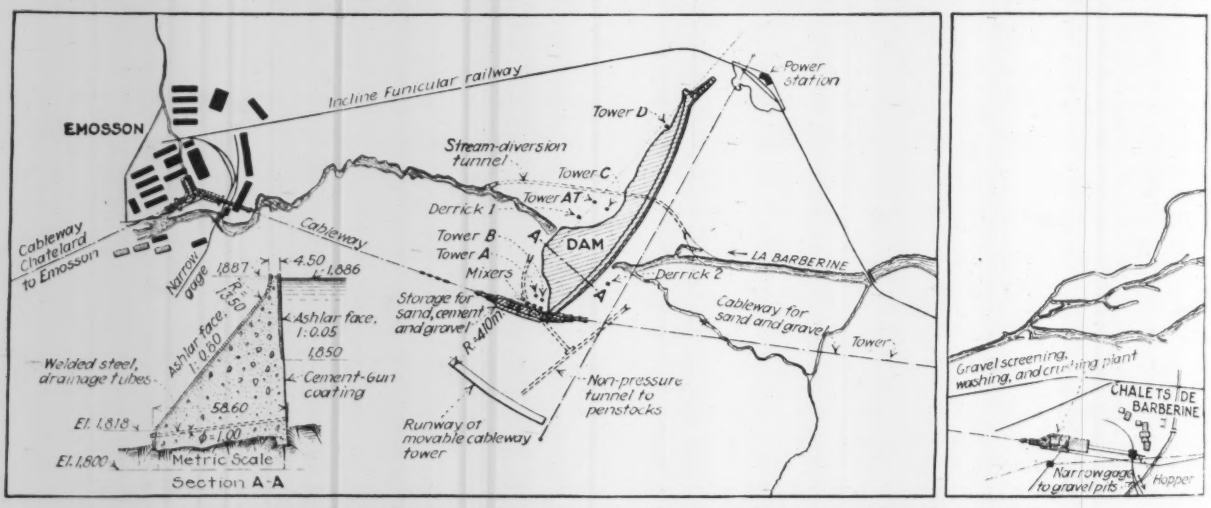


FIG. 6—PLAN SHOWING LOCATION OF DAM AND MATERIAL-HANDLING EQUIPMENT

of the cable tramway which carries the material to the aggregate bins over the mixers. A small hammer mill was later found necessary for pulverizing as the pit run material lacked fines.

A movable 5½-ton cableway was erected at the dam, the head tower being 115 m. above the foundation of the dam. The head tower is on rails and travels through a distance of 100 m. on an arc of 410 m. radius. The distance between the head and tail towers is therefore 410 m., and this cableway can cover the entire area of the dam. It served for removing the material from the foundation excavation, a large part of which excavation has later served for plums. It was also especially useful in erecting the concrete mixing and placing equipment and the aggregate storage bins and in transporting material and equipment across the gorge. It is now being used for placing plums and for handling 25-m. booms were installed at convenient points and assisted with the excavation as well as in handling and placing plums.

The mixing plant consists of three 1-yd. motor-driven concrete mixers, equipped with batch hoppers. Measuring hoppers holding a complete batch are located directly above the mixer hoppers. The three mixers are arranged with hopper switches or gates so that any mixer can discharge to either of the two chute lines. Floor hoppers are also located at the foot of the main towers so that a batch of concrete is always available for the elevator buckets. The two main towers located at the mixing plant are equipped with tower elevator buckets of 30 cu.ft. capacity and these dump to standard tower hoppers usually employed with continuous line chutes for controlling the flow of concrete. The original plan was to operate only two of

the three mixers, one for each chute line, and hold the third in reserve in case of accident to either of the others, but no difficulty has been experienced in having the two chute lines take care of the output from the three mixers, either line easily handling the output from two of the 1-yd. mixers.

On account of the favorable location selected for the batching and storage bins, a large part of the concrete was chuted into the dam without the use of the towers or hoisting equipment, approximately 30,000 cu.m. being handled in this way. The two main towers shown on the plan as A and B are 61 m. high and each supports a 2-in. cable, one of these high line cables terminating at an anchor tower and the other at a rehoisting tower 110 m. distant. The chutes are semicircular in form, 14 in. wide inside and 8¼ in. deep, and are made of No. 12 gage metal. Reliners ¼ in. thick were used on all chutes and have proved very successful, taking care of a full season's pouring without replacement. The chutes are suspended from two-wheeled trolleys on the main cable. Half-inch steel cable is dropped down from the trolleys for from 10 to 20 meters and to these pendant lines the manila rope blocks are attached for raising and lowering the chutes. Counterweighted chute sections 50 ft. long are supported by timber guy derricks at the ends of the chute lines and permit pouring concrete to any part of the dam. Two secondary towers have been provided in which the concrete is rehoisted after having passed through the first line of chutes and is carried to the extreme end of the crest.

The towers and equipment for chuting the concrete were made in America and shipped to the site in carefully marked packages after the design of the distribution system had been carefully worked out on a small scale model of the site. The method used in designing the plant and a description of some of the difficulties encountered in making the layout of the concreting plant accommodate itself to the layout of the movable cableway were given in *Engineering News-Record*, Aug. 11, 1921, p. 231.

The last two seasons' work have averaged 20,000 cu.m. of concrete in place per month. The concrete is poured during one shift of eleven hours and the masonry facing is placed during the night so as not to be interfered with by the concreting operations.

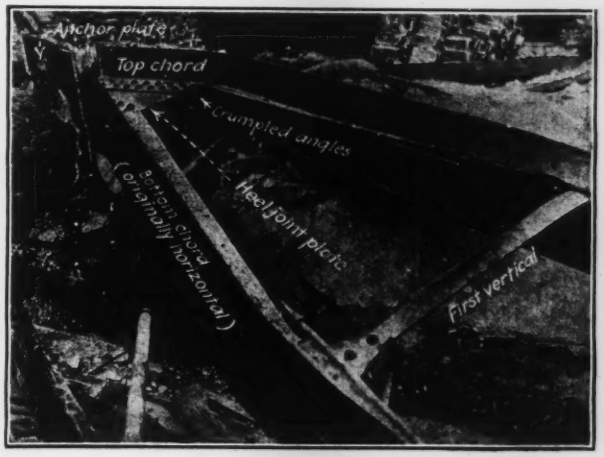
The Swiss Federal Railway Engineers are the designers of the dam and the contracting firm of Martin, Baratelli & Co. of Lausanne has the contract for the construction of the dam and the tunnel.

Small Water Main Costs Assessed on Lots

The cost of water-works mains up to a diameter of 4 in., and the cost of 4-in. mains where a larger one is installed, has been assessed against abutting property at Glendale, Calif., since 1921, when by a small majority the people decided on that plan instead of meeting the cost by bond issues. Both lot frontage and area have been tried, said P. Diederich, superintendent of plant and production, in a paper read before the annual convention of the California section of the American Water Works Association. The frontage plan meets with fewer objections than the area plan where the property is subdivided and of equal depth, but in the case of variable depths the combination is advantageous. Replacement costs are also assessed on property owners.

Designing for Strength in Eccentric Heel Joints for Trusses

METHODS of designing eccentric heel joints in trusses have been under discussion recently (see *Engineering News-Record*, Aug. 30, Sept. 12 and Oct. 4, pp. 339, 447 and 568), but some structural engineers consider that although it is possible to make such a



ROOF TRUSS FAILED AT HEEL JOINTS

joint of sufficient strength it is an inherently bad design, owing to the difficulty of so detailing it as to provide adequately for secondary stresses. They consider that if it is made of sufficient strength it will involve an excessive amount of material and still be a bad design.

An illustration of the possibility of danger in eccentric heel joints is given by the accompanying view of a roof truss which collapsed on account of the failure of such a joint. It is one of the trusses carrying the roof of a theater, the span being about 60 ft. and the spacing between trusses 21 ft. The bottom chord was horizontal and top chord curved or polygonal. All trusses had been placed and were connected by sway bracing and the roof. Both ends of this truss failed under its load causing the wreck of the entire roof.

Each chord was composed of a pair of angles, and the heel joint was made simply with a plate riveted between the angles. In failing, both chords buckled downward in the first panel and the vertical legs of the top chord angles crumpled up in N-shape at their connection with the end plate and downward at the first panel point from end bearing.

It is said that joints of this type have been adopted in some cases simply to avoid the trouble of bevel shearing of the top chord to fit the lower chord in such a way that the center lines of the two members will meet at the center of bearing plate.

Iodine Water Treatment at Sault Ste. Marie

As a preventive of goitre, the city of Sault Ste. Marie, Mich., has adopted the plan of introducing sodium iodide into the city water supply at the rate of 2 lb. a day for two weeks, twice a year. The first application, according to an article by Henry A. Sherman, city manager of Sault Ste. Marie, in the *City Manager Magazine* for December, was made in August, 1923, when the pumpage rate was about 3 m.g.d. dailv.

To Build Three High-Head Power Plants in Norway

Heads Up to Three Thousand Feet—Stream Flow to Be Supplemented by Storage—Many Miles of Tunnels

BY EDWARD SVANÖE
Chief Engineer, A. S. Aura Co., Sundalen, Norway

THREE HIGH-HEAD power plants are planned in the Western highlands of Norway, 80 miles from Trondhjem, which will have a continuous output of 291,900 hp. and a total installation of 383,000 hp. They will be formed by concentrating the runoff from an area of 460 square miles into three plants, the third plant being supplemented by two streams of small runoff. The annual precipitation on this area ranges from 28 in. to 150 in. and the average runoff is from 26 to 42 gal. per square mile. It is estimated that over 55 per cent of the annual runoff can be used for storage by the construction of reservoirs in the deep valleys. The following table gives the details regarding the three projects:

Power Station	Head in Ft.	Regulated Flow in Sec.-Ft.	Estimated Storage Per Cent	Continuous Hp.	Installed Hp.
Lilledalen	2,600	400	55	93,000	125,000
Aura, Finset	2,100	680	66	130,000	170,000
Aura, Kuhammeren	3,000	760			
	2,600	76	58	68,900	88,000
	390	88			
			Total.....	291,900	383,000

Work has already been started on the first power plant, the one at Lilledalen. The water for this plant will be carried through a tunnel 11 miles long roughly paralleling the valley of the Lilledalen River to a surge basin 2,600 ft. above sea level on the cliffs above Sundals Fjord and then down to the power house in six steel penstocks. The surge basin is of an unusual design. It is shown in detail in Fig. 1.

As the tunnel is located along the side of the valley it is reasonably close to the surface and consequently can be driven from numerous adits along its whole length. Two miles of the tunnel have already been dug and adits for the remainder are being opened. Further completed work includes a power station of 2,400 hp., 17 miles of narrow-gage railway, air compressor plants, 5 incline ropeways, barracks for 1,000 men and permanent dwellings for 100 families. Work on the dam has not been started as it has not been definitely decided whether gravity type or multiple-arch dams will be used.

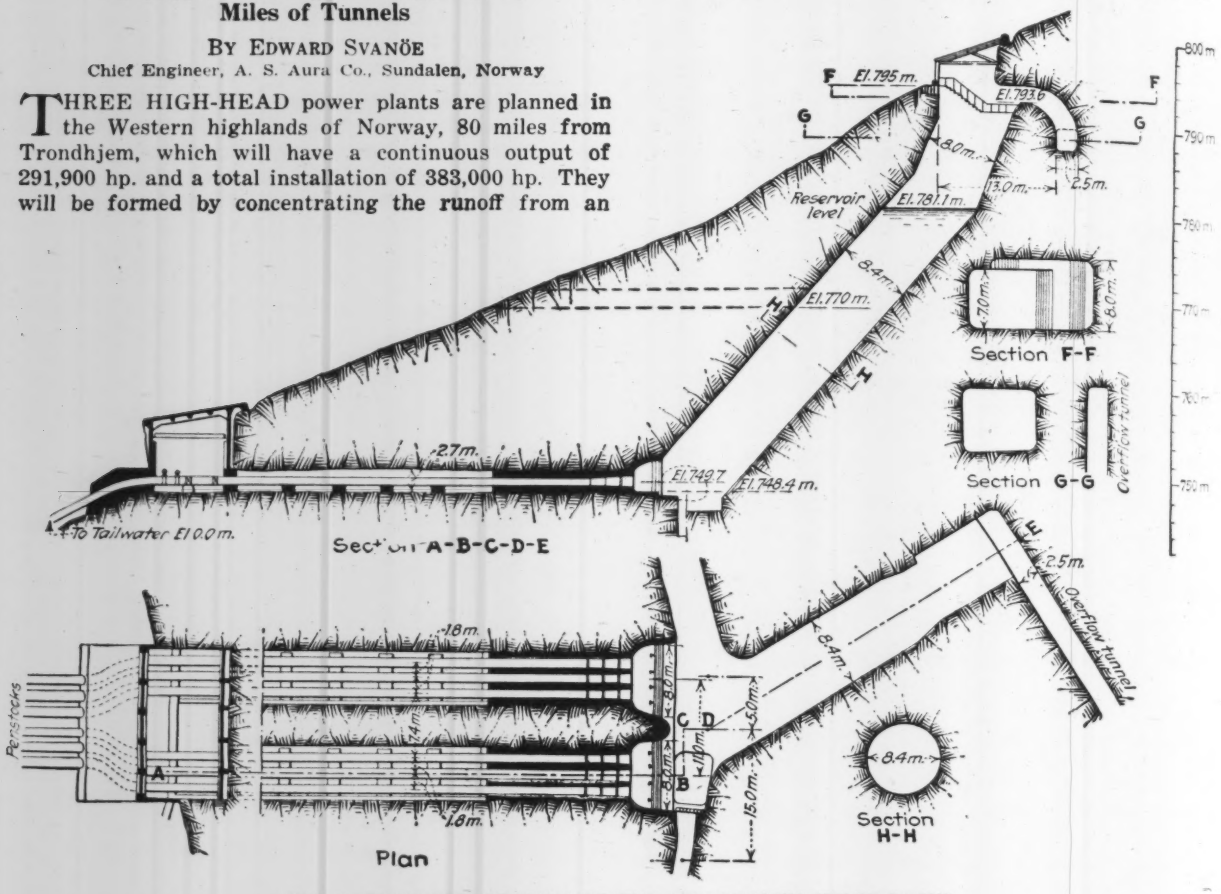


FIG. 1—PLAN AND SECTION OF THE LILLEDALEN SURGE BASIN

It is expected that the plant will be developed in stages of 50,000 hp. each. Work on the first stage includes the excavation of the canal to the full section of 130 sq.ft., 52,000 cu.yd. of masonry in the dam, and 1950 tons of steel in the penstocks.

A comparison of the costs of hydro-electric development in Norway and America is interesting; it is largely affected at present by the depreciated value of the krone, which is only about 63 per cent of its normal value. Labor is plentiful and gets about 31c. an hour, consequently Norwegians use more manual labor and less machinery than Americans. The cost per horsepower-year for the first 100,000 hp. installation will be about $7; and when the total development of 291,900 hp. has been installed, this will be reduced to about $5 per horsepower-year. In *Engineering News-Record* of April 13, 1922, page 601, R. C. Starr stated that a

50,000-hp. development in California would cost about $15 per horsepower-year. Consequently under present conditions large hydro-electric installations can be made

FIG. 2—LOOKING UP THE LILLEDALEN RIVER FROM THE SURGE BASIN

The headrace tunnel will be in the hills on the right.

in Norway at about half the cost of installation in the United States.

Eductors for Washing the Rapid Filters at Zelienople

Increase in Throat Size Substantially Increased Output on a Three to One Basis of High Pressure to Suction Quantity

By Leo Hudson

Of Hudson & Myron, Consulting Engineers, Pittsburgh, Pa.

IN A SMALL filter plant recently designed for the Borough of Zelienople, Pennsylvania, the funds available necessitated economy in every possible direction. As a consequence an eductor was installed instead of the usual reducing valve on a pressure line, a wash-water pump or high tower wash-water tank. By this method, two portions of the water are taken from the clear well and one from the high pressure tank.

The filter area of the two 300,000-g.p.d. units was 9x12 ft. As the design was for a high rate wash, the maximum demand for 15 gal. per square foot per minute, or 1,620 g.p.m., required an eductor having an average flow of at least 1,500 gal. per minute.

When it came to the official test, it was found that the eductor furnished had inlet and outlet connections of 8 in. and available throat diameter of 3.75 in. The output was 1,251 g.p.m. under a tank pressure of 110 lb. After taking the matter up with the manufacturers, the throat was increased to a diameter of 4.33 in. without any bad effect on the metal remaining. As a result of this modification, it was possible to secure a maximum amount of 1,731 g.p.m. The pressure gage immediately in front of the eductor at this rate showed about 80 lb. and the pressure gage on the discharge end of the eductor 3 lb.

As a result of this experience, the writer has come to the following conclusions:

1. The eductor, if properly designed and installed, is an economical way to supply wash-water to rapid sand filter units in both first cost and the cost of operation.

2. In a plant of several units, and in terms of a variable head due to the progress of a filter wash, the variable conditions are such that in terms of an improper design the eductor may not be found to be a successful solution of the problem.

3. The data given the manufacturer should be in terms of at least 50 per cent more water than is desired under the maximum condition and also the variable condition should be controlled by the throttling of the wash-water valve between the eductor and the filter unit.

4. A pressure relief valve should be installed in the line between the discharge end of the eductor and the gate valve on the wash-water line to the filter units.

5. Careful consideration should be given to the reduced head caused by the inflow of water through the eductor, and the manufacturer should be given all of the conditions as to the diameter of the line and the length of the supply line, unless it is contemplated to operate the high service pump during the process of washing.

6. A "special," preferably a tee with a blank flange looking upward, should be inserted immediately ahead of the eductor for the purpose of removing any obstruction which might come to the throat of the eductor, the flange of the tee acting as a hand-hole.

7. Immediately in front of the special tee, there should be inserted a gate valve, and the washing process should be in terms of opening and closing this valve, using the gate valve between the discharge end of the eductor and the filter unit merely as a control valve.

8. A foot valve, or check valve, should be installed on the intake line to the clear well to guard against a possible inflow of water from the high service tank back into the clear well and this foot valve should be balanced.

9. In case of any foreign matter in the supply line entering the eductor, the flange between the special, mentioned above, and the pressure end of the eductor should contain a copper strainer drilled with a sufficient number of holes to provide an area at least equal to the area of the throat of the eductor.

10. The size of the wash-water line should be made at least 2 in. larger than the theoretical calculations would call for to permit further control and regulation of the valve between the end of the eductor and the filter unit.

The eductor was made by the Schutte & Koerting Co. and installed by F. B. Leopold, sub-contractor for the equipment of the filtration plant.

Large Bridge Crane for Indian Railways

A bridge crane built recently for the reconstruction and strengthening of numerous bridges on the Indian State Railways has a steel deck or floor 50 ft. long mounted on four four-wheeled trucks giving a total wheelbase of 44 ft. Equalizers distribute the load upon the trucks. Both axles of the two outer trucks are driven by gearing, while the two inner trucks are equipped with vacuum brakes and hand brakes. The crane is for the Indian standard gage of 5 ft. 6 in., but has outriggers with supporting jacks to give a base width of 10 to 16 ft. A revolving frame carries the engine, drums, and boom. The goose-neck boom, of plate girder construction, can handle a 20-ton load on a reach of 25 ft., without the use of outriggers, or 12 tons on a reach of 43½ ft. parallel with the track. Since the machine may be used also as a wrecking crane it is so designed that it can be hauled at full speed in a train. Its total weight is 136 tons and all dimensions are within clearance limits, the boom being lowered upon an idler car when the crane is being hauled from place to place. This crane was designed by Rendel, Palmer & Tritton, consulting engineers for the railways, and was built by Ransomes & Rapier, London.

Building the Hudson River Connecting Railroad

Need for a New Hudson River Crossing at Albany, N. Y.—Difficulties in Getting the Project Approved—Economies to Be Effected by the New Line—Details of the Great Classification Yard at Selkirk

COMPLETION of the plans of the Selkirk Yard of the Hudson River Connecting R.R., just south of Albany, N. Y., marks another step in the rapid progress on that great undertaking and makes it desirable to review the causes which led up to the construction of the yard and railroad before describing the yard as now laid out. Subsequent articles will describe the bridge, and the interesting features of the construction of the yard and connecting railroad.

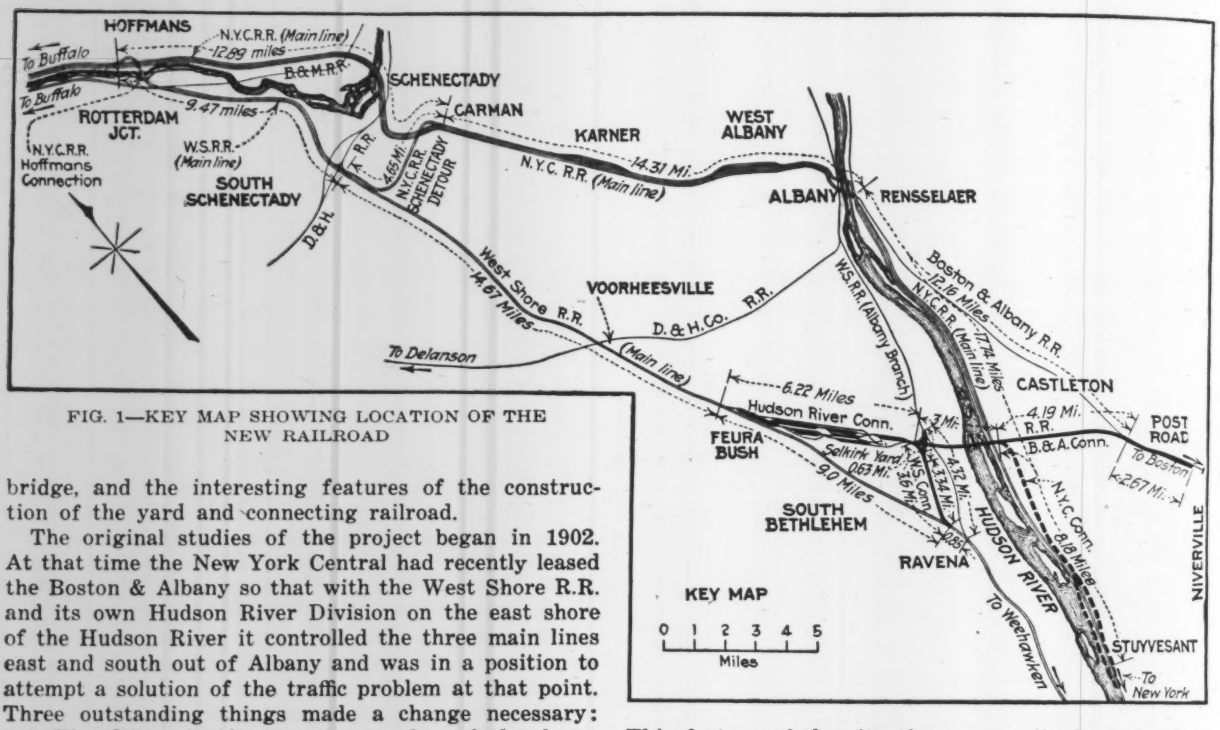


FIG. 1—KEY MAP SHOWING LOCATION OF THE NEW RAILROAD

The original studies of the project began in 1902. At that time the New York Central had recently leased the Boston & Albany so that with the West Shore R.R. and its own Hudson River Division on the east shore of the Hudson River it controlled the three main lines east and south out of Albany and was in a position to attempt a solution of the traffic problem at that point. Three outstanding things made a change necessary: (1) The delays incident to the opening of the drawbridge in the low level crossings of the Hudson River; (2) the heavy grades and consequent pusher service between Albany and the yards at West Albany; (3) the lack of adequate facilities at the West Albany yard and the prohibitive cost of enlarging the yard on account of the encroachment of the city upon it.

The first plan called for a high level crossing at Albany. This change would only have eliminated two of the problems and would still have sent all the traffic through West Albany, including freight from or for the West Shore R.R. that required reclassification. Inspection of the plan in Fig. 1 will show how the location of these New York Central lines suggested the desirability of a crossing and a new yard below Albany. This feature of the situation was realized by the Central's engineers and as soon as a desirable location was found application was made to the War Department for authority to bridge the Hudson near Castleton. Opposition to the plan developed in Albany almost immediately, for it was felt that by the construction of this new line the city would lose its commanding position as a railway center. The opposition culminated

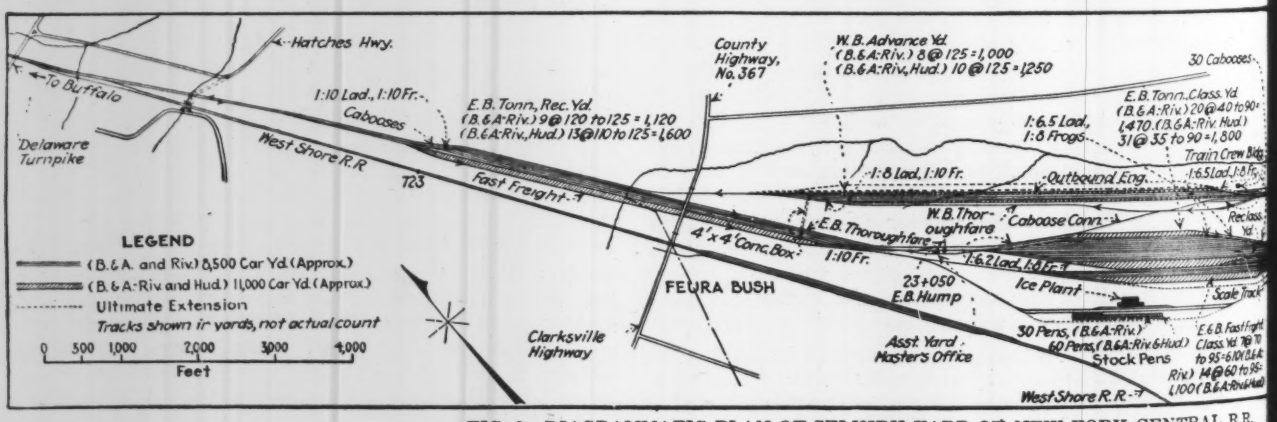


FIG. 3—DIAGRAMMATIC PLAN OF SELKIRK YARD OF NEW YORK CENTRAL R.R.

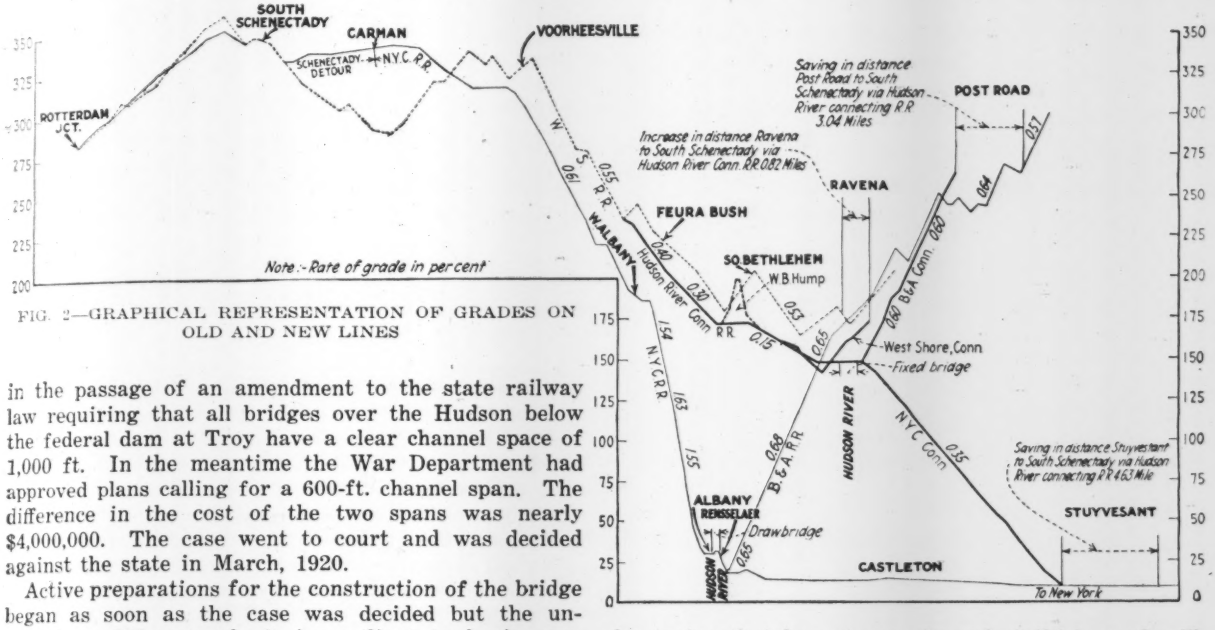


FIG. 2—GRAPHICAL REPRESENTATION OF GRADES ON OLD AND NEW LINES

in the passage of an amendment to the state railway law requiring that all bridges over the Hudson below the federal dam at Troy have a clear channel space of 1,000 ft. In the meantime the War Department had approved plans calling for a 600-ft. channel span. The difference in the cost of the two spans was nearly $4,000,000. The case went to court and was decided against the state in March, 1920.

Active preparations for the construction of the bridge began as soon as the case was decided but the unsettled conditions made it inexpedient to begin construction until 1922.

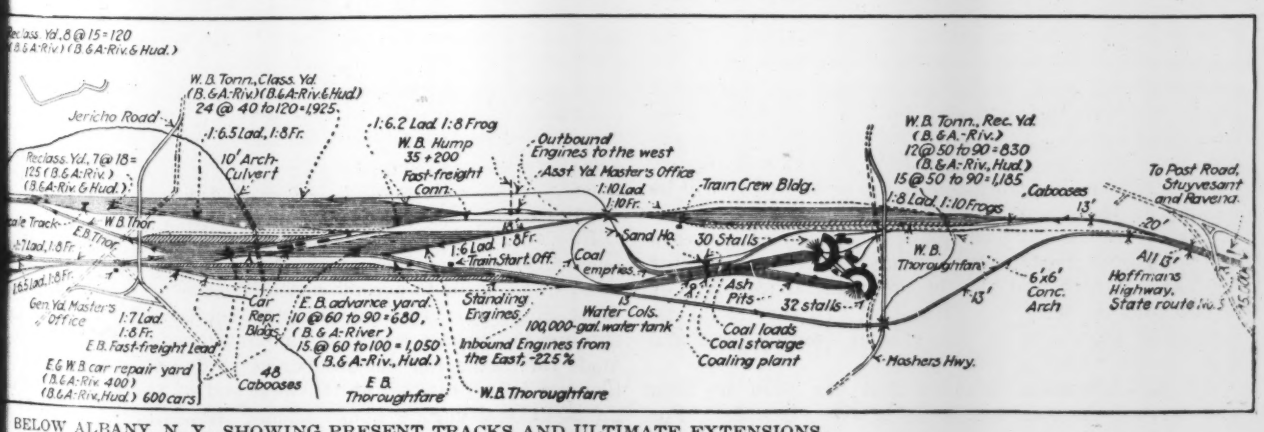
The contract for the substructure of the Hudson River bridge and for all track construction to subgrade, including overhead highway crossings, was awarded to the Walsh Construction Co., in the late spring. This contract does not include the Hudson River Division connection. At the same time the contract for the superstructure of the bridge was let to McClintic-Marshall Co., of Pittsburgh.

Fig. 1 shows the location and Fig. 2 a graphical representation of the situation in regard to grades. The economies which justify the expenditure of such a large sum—approximately $20,000,000—are found in the elimination of pusher service at Albany, a saving of distance, a saving in rise and fall, particularly in the Boston & Albany Line, speeding up of freight train classification by relieving the burden on existing yards and by the concentration of yards and engine terminals, by improved features of yard operation, and a saving in time in freight train operation. The saving in distance between Boston and the West as now operated via West Albany and the Schenectady detour will be 3.04 mi.; the saving between New York and the west will be 4.63 mi.; and the increase over the West Shore line for trains that have to go through Selkirk yard will be 0.82 miles.

The immediate improvements in favor of Boston & Albany traffic will be a saving in vertical rise and fall of nearly 250 ft. The saving in time to be gained by the elimination of the low level crossings of the Hudson River by drawbridges is considerable and will increase as the traffic on the river increases. Another saving in time, which it is difficult to compute, will be the reduction of delays to passenger trains through the Albany territory, made possible by the removal of a considerable portion of the existing freight traffic and by making use of the Albany freight bridge for dead-head movements across the river.

The magnitude of the undertaking made it inadvisable to start construction of the whole project at one time. Instead it is being developed in steps. The first step includes the Boston & Albany and the West Shore R.R. connection, the Hudson River bridge, and the first stage of Selkirk yard. The 8.2-mi. connection to the Hudson River Division on the east side of the river will be undertaken at a later date.

Selkirk Yard—As now planned the gravity freight classification yard at Selkirk will be built in two stages; first an 8,500-car capacity for Boston & Albany and


Reclass. Yd., 8 @ 15 = 120
(B. & A.-Riv.) (B. & A.-Riv. & Hud.)
W. B. Tonn., Class. Yd.
(B. & A.-Riv.) (B. & A.-Riv. & Hud.)
24 @ 40 to 120 = 1,925
Jericho Road
1:6.5 Lad., 1:8 Fr.
1:6.2 Lad. 1:8 Frog
W. B. Hump
35 + 200
Fast-freight Conn.
Outbound Engines to the west
Asst. Yd. Master's Office
1:10 Lad.
1:10 Fr.
Train Crew Bldg.
W. B. Tonn., Rec. Yd.
(B. & A.-Riv.)
12 @ 50 to 90 = 830
(B. & A.-Riv., Hud.)
15 @ 50 to 90 = 1,185
Cabooses
1:8 Lad. 1:10 Frogs
To Post Road, Stuyvesant and Ravena
Reclass. Yd., 7 @ 18 = 125 (B. & A.-Riv.) (B. & A.-Riv. & Hud.)
10' Arch Culvert
W. B. Thor.
E. B. Thor.
1:7 Lad. 1:8 Fr.
1:6.5 Lad. 1:8 Fr.
1:6 Lad. 1:8 Fr.
Train Start. Off.
Coal
Sand Ho.
30 Stalls
W. B. Thoroughfare
6'x6' Conc. Arch
All 13'
Hoffman's Highway. State route No. 5
Gen. Yd. Master's Office
1:7 Lad. 1:8 Fr.
E. B. Fast-freight Lead
E. B. advance yard. 10 @ 60 to 90 = 680, (B. & A.-River) 15 @ 60 to 100 = 1,050 (B. & A.-Riv., Hud.)
Car Repr. Bldg.
Standing Engines
Water Cols.
100,000-gal. water tank
Ash Pits
32 stalls
Inbound Engines from the East, -22.5%
Coal loads
Coal storage
Coaling plant
E. & W. B. car repair yard (B. & A.-Riv. 400) (B. & A.-Riv., Hud.) 600 cars
48 Cabooses
E. B. Thoroughfare
W. B. Thoroughfare
Mohawk Hwy.

BELOW ALBANY, N. Y., SHOWING PRESENT TRACKS AND ULTIMATE EXTENSIONS

FIG. 4—HEAVY GRADING FOR EASTBOUND RECEIVING YARD

West Shore business, with a later expansion to an 11,000-car capacity to accommodate the Hudson River Division when the connection to that line is made. However, in order to eliminate interference with the operation of the yard when the latter expansion takes place, the grading, culverts and bridges required for the completed yard are included in the present contract.

The yard will eventually have nine main subdivisions, a westbound receiving yard, a westbound tonnage classification yard and a westbound advance yard; an eastbound receiving yard, two eastbound classification yards, one for fast and one for tonnage freight, an eastbound advance yard, a car repair yard and an engine terminal. As westbound fast freight will require substantially no classification at the new yard it will be handled in the receiving yard.

The car repair yard will have a capacity of 400 cars at the time of construction and an ultimate capacity of 600 cars. There will also be an artificial ice plant of 50,000 tons capacity for icing cars. In the initial development there will be thirty stock feeding pens and sixty in the ultimate development.

Ground formation dictated that the yard be long and narrow, the total length being over six miles. For the same reason the two humps are widely separated. The natural fall of the ground eastward toward the Hudson River simplified the construction of the E.B. hump and yards, but the W.B. hump and yards required considerable filling. Advantage of this latter condition is taken in the layout of the outgoing westbound engine track which passes under the hump track and thoroughfare track to the north side of the yard and then west to the advance yard. The thoroughfare tracks are in the middle of the yard to minimize crossings. The incoming westbound engine track is swung around in a semicircle between the inbound and the outbound track thus turning the engines and at the same time providing a wye track for emergency use. There will also be a through track on the south side to expedite the movement of fast freights and of incoming engines.

The difference in tonnage hauled east and south of Albany and that handled west had made desirable a wide range in the length of the individual sections of the new yard. West of Albany the average train length is 125 cars while east and south the train length varies from 35 to 90. This difference in train length has been carefully considered in the design of both classification yards. These yards have been developed so that there will be a minimum of reclassification and rehandling and provision has likewise been made for such classifications as it is not deemed advisable to handle over the humps. Another feature of the yard is a short track reclassification yard at the forward end of the main classification yards where the final filling out of trains can be done. There will be scale tracks in each of these reclassification yards.

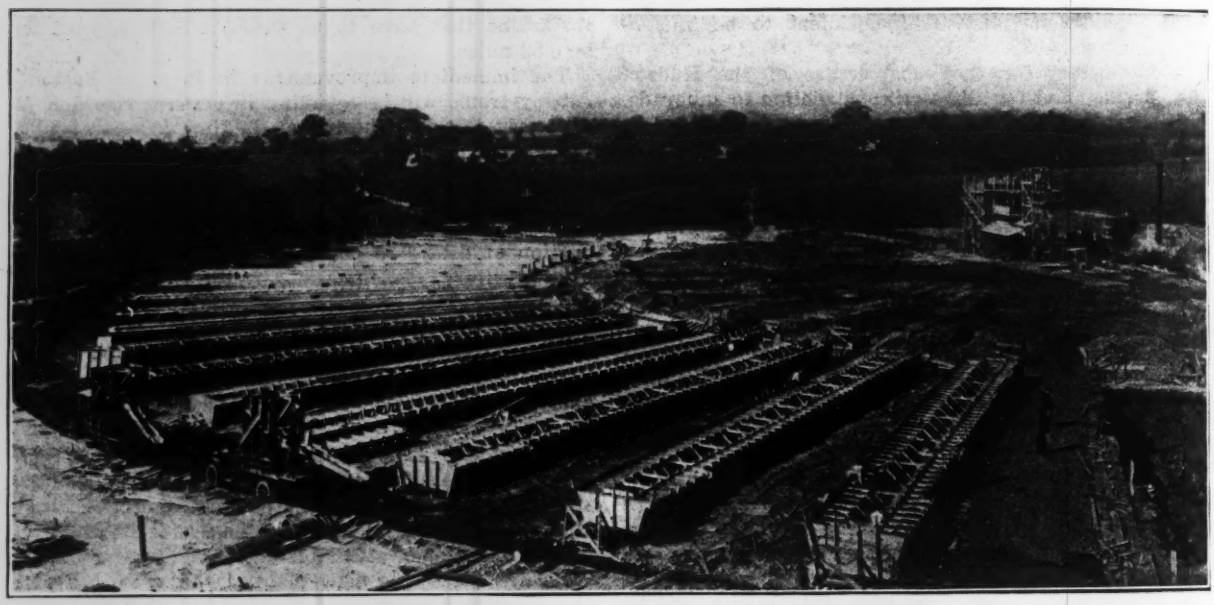


FIG. 5—FOUNDATION WORK ON ONE OF THE ENGINE HOUSES

Engine Terminal—There will be two engine houses, one of 30 stalls for Mohawk Division power and the other of 32 stalls to accommodate the Boston & Albany, West Shore and Hudson Division equipment. In designing the engine terminal, ample provision has been made for increasing the number of stalls and space has likewise been provided at the west end of the yard for an additional engine house should the future develop

FIG. 6—10-FT. ARCH CULVERT UNDER THE YARD
Showing the heavy filling near the east end of the yard.

that necessity. The stalls will have a normal length of 120 ft. and the drop-pit stalls will have variable lengths with a minimum of 140 ft. The turntables will be of the three point bearing type 100 ft. long.

The coaling plant will be mechanical type, duplicate machinery, with a rated capacity of 1,200 tons. It will serve six tracks. Ash pits will be provided of the water type and will be constructed to provide for at least three days' storage when adverse conditions so demand. These pits will be constructed in units, each of which will accommodate two engines on separate tracks and, further, will be of the cylindrical type similar to those installed in the Solvay engine terminal of the New York Central near Syracuse. They are more economical in first cost and maintenance than the older type of longitudinal rectangular pit and permit greater flexibility in operation. No special cinder handling equipment is required other than the ordinary clamshell bucket to empty the pits when they become filled.

Progress—Such rapid progress has been made on the preparation of the subgrade of the yard that it is expected that the portion for the Boston & Albany and West Shore traffic will be completed early this year. Track laying in the yard is well under way.

The design and construction work on the Hudson River Connecting R.R. is in charge of George W. Kittredge, chief engineer, J. W. Pfau, engineer of construction, R. E. Dougherty, designing engineer, H. T. Welty, engineer of structures, and J. H. Van Buskirk, mechanical engineer. The field work is in charge of W. F. Jordan, principal assistant engineer, B. C. Martin and B. W. Farnham, resident engineers. The construction, with the exception of the delivery and erection of steel for the bridge over the Hudson River, is under contract with the Walsh Construction Co. of Davenport, Iowa, and is under the immediate supervision of H. C. Kahl and David Small, vice-presidents, and Daniel Terry, superintendent. The fabrication and erection of the steel for the bridge over the Hudson River is under contract with McClintic-Marshall Co., Pittsburgh.

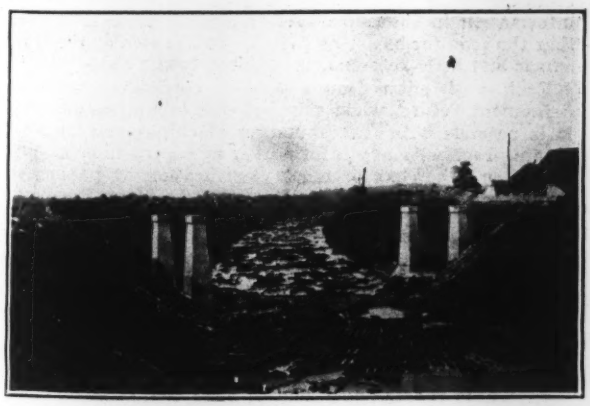


FIG. 7—ONE OF THE MAIN LINE CUTS
An excellent example of modern dragline excavator work.

Geodetic and Topographic Mapping

SUMMARIES of what the geodetic and topographic surveys of the United States have accomplished were given a few weeks ago by William Bowie, of the Coast & Geodetic Survey, and Glenn Smith, of the Geological Survey, before the Board of Surveys and Maps at Washington.

According to Mr. Bowie, geodetic work began about 100 years ago and at first was confined to secondary triangulation along the coast. This was later extended to precise triangulation of inland areas, and by 1890 triangulation along the 39th parallel connected the Atlantic and Pacific coast networks. Ten years later 7,000 miles of precise control had been completed, and at present 20,000 miles are completed. Precise leveling, begun in connection with this work, reached 15,000 miles in 1900, 29,000 miles in 1912, and 47,000 miles in 1923; of the present total, some 16,000 miles were contributed by other organizations than the Coast & Geodetic Survey, among them the Corps of Engineers on work connected with the Mississippi River and the Great Lakes. It is planned to continue the precise leveling so that no point in the country will be farther than 50 miles from a precise-level benchmark. Triangulation is to be extended so that no point will be more than 100 miles from a station. Triangulation is needed urgently along the Canadian border from Lake Superior to the Pacific Coast. It is planned to extend triangulation along southeastern Alaska, connecting with the Canadian geodetic work.

Topographic survey work, carried out with state cooperation, covered 13,500 sq.mi. in 1923 (year ending June 30). This was done with funds amounting to $655,000, of which $286,000 were contributed by state allotments, 23 states co-operating. During the current fiscal year $900,000 are available. Texas largely increased its allotment, and about fifty field parties will work in that state during the present season. Further increase in state allotments is expected during the year beginning next July.

Hydraulic Power Exposition Planned for France

The Minister of Public Works of France has announced that he will demand government credit of 3,000,000 francs for the country's participation in an exposition of the hydraulic and allied industries which is to be held from May to October, 1925. An equal sum will be granted by the departmental governments in the French Alps, where the most important hydraulic installations of France have been constructed. Finally it is announced that there will be a government authorized lottery of 9,000,000 francs in prizes which will produce another 5,000,000 francs for the organizers, in all 11,000,000 francs.

Business and Engineering of Road Construction

Condensed Talks by Leading Authorities on Administration, Design, Materials, Traffic, Contracting and Construction at the American Road Builders Association Convention

Road building is the "big business" in public works of the American people. At Chicago, this week, a cross-section of the road building business is being presented by the convention and exhibition of the American Road Builders Association and the meetings of a dozen other associations representing interests concerned in road construction. An account of the work of these meetings, with a critical review of the extensive exhibits of machinery and materials, will appear in our issue next week. Of the two-dozen formal technical papers presented before the A.R.B.A., a number are given in abstract this week and abstracts of others will follow in succeeding issues. These papers are unusually authoritative pronouncements on their subjects and merit careful study.

Traffic Surveys, Methods and Costs

BY GEORGE E. HAMLIN

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IT IS NOT the purpose to detail at this time data to be obtained from a traffic census. These should cover every phase which is of value in determining traffic conditions both in regard to weight and quantity. Length of haul, type of commodity, and seasonal variation must be considered in making up the blank forms. Enough data should be obtained to determine the competitive value as against other forms of transportation.

Scales of suitable size must be installed at strategic points for the purpose of obtaining actual weights carried on trucks of each capacity. No other method will determine the overweight per capacity or the tendency to overload the smaller trucks beyond their safe or registered load.

In the case of passenger cars, data must be obtained from which the average number of passengers per car, the average distance of trip and the pleasure or business use of the car is demonstrated. Stations must be placed at points where traffic naturally divides so that not alone the relative value of any particular road may be determined but the value of each section of such road. The location of these stations should be determined by men thoroughly familiar with the locality and with traffic conditions.

It is, of course, impracticable to establish a census party for continuous operation at each station. It is therefore necessary so to route parties that they will occupy each station successively on different days of the week so that weekly as well as seasonal variation may be determined. Each station should be occupied at least once each month and the number of parties will vary with this requirement and the number of stations established.

Each party should consist of not less than four men. On the more heavily traveled thoroughfares, it has been found that, not to cause too long a questioning period, six men may be required. Each party should be motorized not alone to change from station to station in the shortest period of time, but so that necessary equipment may be with the party at all times.

The survey, in general, should be under the field charge of a director thoroughly familiar with all sections covered by the census. His duties should consist in keeping in close touch with each party through its chief so that decision in regard to new conditions may be made at once.

If each station is occupied once each month, each party will be able to take care of 28 stations, so that there must be one party for each 28 stations established. Each party should work a definite number of hours per day, these hours being varied at successive occupancies of the same station so that daily variation in traffic may be determined.

Arrangements should also be made to take a continuous 24-hour survey at controlling stations, this giving an opportunity to transpose the 8- or 9-hour period into a 24-hour period on a proportion basis.

Scales should be of the pit platform type, capable of taking the largest loads in operation on any highway. In practice, it has been found that the 20-ton type, with a maximum capacity of 28½ tons, is most practical, as it is possible in case of loads in excess of this amount to weigh the front and rear axle separately and to combine the weights for a total load. This method by test has been found to be satisfactory, providing the approaches are on a level grade. The platform dimensions are 9x24 ft. With the proper concrete pit, the cost of the completed scale averages about $2,700.

In operation, the parties function through a chief and three or five men. Two of the party take the necessary measurements of truck, tires, etc., and the third man takes the weights of both front and rear axle and interrogates the driver in regard to points of origin and destination, type of commodity, and regularity of movement. In the case of passenger cars, the observers obtain by inspection much of the required data and the driver is questioned only as to points of origin and destination and as to pleasure or business use of the car.

A sign clearly displayed, giving the purpose of the questioning is the greatest aid in saving time and eliminating useless questioning by occupants of the car. The next greatest asset in courtesy. Very rarely will an operator refuse to give the required information, recognizing its value in increased efficiency of the road building program

Newspaper publicity in the sections where the census is in operation is well worth while, as by this method cooperation is obtained from the driver who realizes that a quick response on his part will aid traffic conditions.

Much of the tabulation is simplified if code forms are used, and these also greatly simplify the tabulation of the information in the office. After a short time, it is found that the code forms are as familiar to the men as the actual names and little reference is required to the code table.

Each car is entered on a separate card which becomes a permanent record when punched for tabulation purposes. It is possible with the tabulating machines now in use to obtain practically any information in regard to make, type, weight or other car or truck classification by passing the cards through the machine after adjustment has been made for the type of information desired.

The taking of the data represents only a fraction of the work required. The cards collected by the director should be sent to the tabulating bureau at regular intervals. These cards are passed to operatives who transfer the written information to the punch cards for use in the tabulating machines. From the data obtained charts and curves are platted showing the various results obtained from the survey. These charts show hourly, daily and seasonal variation of traffic distribution at various times of the year.

After the first complete census has been taken, it is expected that stations will be occupied at critical points during succeeding years and that following the original curve additional curves can be established from which can be estimated potential traffic at a future period.

Under labor conditions in the East, the cost of operating a census party, including transportation, salaries, expenses, and necessary equipment has been in the neighborhood of $9,000 per year. Light traffic conditions during the winter months and consequent reduction of party numbers has tended to reduce cost at this time. On the other hand, abnormal conditions of summer travel have increased the number of observers required so that the average is about that above stated. On the basis of 28 stations to each party, the cost per station should approximate $225 per year.

* * *

Simplified Practice—A Service to Road Builders

By Ray M. Hudson

Division of Simplified Practice, Department of Commerce, Washington, D. C.

IN THE ROAD building materials field, certain materials have been simplified as a preliminary step toward their ultimate standardization. Two years ago, the manufacturers of paving brick were producing 66 varieties. They made a survey of the relative demand for each, and found 90 per cent of the business was done in 16 per cent of the line, or in 11 varieties. Then they decided to eliminate the 55 varieties that brought them only 10 per cent of their annual volume. Six months later, the Standing Committee asked our help in eliminating 4 more. Last spring they dropped out one more. What was the result? A steady increase in shipments ever since simplification was applied. Not only that, but these manufacturers stopped their nonsensical practice of competing with each other and focussed their attention on their real competitors, the manufacturers of *other* kinds of paving material.

Whether or not this action by the paving brick manufacturers had anything to do with it, our attention was called to the fact that there were 88 varieties of asphalt used for paving purposes and 14 varieties used as brick and stone block fillers. We co-operated with the Asphalt Association and other interested groups and cut the varieties of asphalt to 9, as indicated by their penetration limits, and fillers to 4. Since 3 of the grades adopted for fillers are identical with 3 of those adopted for paving use, the actual reduction was from 102 to 10, or practically a 90 per cent elimination. One manufacturer said at the time, "Had this simplification been effected a year ago, it would have saved our company over $200,000."

Now think of the other materials used in highway construction. Cement is made according to standards, crushed stone is screened and sold according to size, but how about present varieties in granite blocks, wood blocks, road oils and tars, culvert and drain tiles, reinforcing bars, and explosives? Isn't there a real opportunity here for the highway materials manufacturers and other associations to cooperate in simplification?

Speaking of explosives, how many varieties are there? Who knows? One manufacturer submits this information: "Strength formulas 625, diameters 40, lengths 14, styles of package 6, possible varieties, 2,100,000, exclusive of brand names, weight and color of paper, and number per package of cartridges." Would simplification make blasting any easier or cheaper? Why not investigate and find out?

Take the simple matter of equipment sheds, contractors' storehouses, etc., standardized buildings, cut to order in the shops and shipped ready for assembling and erection are not the novelties they once were, but it was only after years of following the conventional practice of making a big hole for the big dog, and a smaller one for the pup, that one manufacturer decided that three sizes of steel doors would answer for the majority of traffic openings in industrial buildings.

In the equipment field, the A.G.C. Joint Committee on Construction Equipment has ably demonstrated the practicability of simplification in this field from the lowly hand shovel, and its associate, the wheelbarrow, clear through to the giant mixers, and pavers. But there is still much to be done. When you think of the different sizes, models, types, and styles of road rollers, graders, tractors, dump wagons, scarifiers, crushers, and so on, wouldn't it be well worth while to simplify the line first, and thus clear the way for standardization? It has been thoroughly proved in manufacturing that variety creates expense whereas quantity creates income. The first step toward quantity production is simplification.

With further regard to equipment the only way by which you can obtain more continuous operation at minimum expense, and reduce "out-of-service" time for break-downs, or moving and setting up on a new location, is to standardize your whole mechanical outfit along the lines of developing a *minimum number of varieties* of any one thing to serve a *maximum number of uses.*

The standardization of processes or methods is equally essential. Time is the essence of most contracts, and perhaps no industry suffers as much through lost time as does road-building. It has been estimated that time lost in road building runs as high as 40 per cent or more of the total calendar days of the year, Sundays and holidays taking up the greater portion, with shortage of materials and adverse weather conditions running a close second. It is said that moving equipment consumes more time than break-downs. Obviously, the industry should adopt as standard those methods which give the greatest output in the least time, consistent with the quality required, and thus seek to raise the general average of performance.

In labor performance, the question is not one of more man-hours, but of *more production per man-hour!* The real answer to America's immigration problem for the road builder is the substitution of machine processes and mechanical devices for human labor in every instance possible. Obviously, standardization plays a very important part in keeping equipment available for use, and in facilitating performance records.

In accounting, there is further opportunity for standardization of methods, procedures, and forms. That standard cost accounting methods should be more widely used is plainly evident when you consider that price, the consideration which governs the placing of most contracts, is something far different from cost. Cost is determined largely by the contractor's ability to complete the job within a given time, and within a given price. A manufacturer can raise the price of his product when costs run high, but the contractor is not so lucky. Among all the people who need to know their costs every minute of the day, the road builder is at the head of the list.

Regarding road designs, the increasing use of motor cars and trucks brings out the need for greater standardization in this phase of the work. What new developments in highway design will come from this intensified demand for better roads remains to be seen, but it is very evident that demand will ultimately be met by a "universal type of highway."

In conclusion, there is one great reason why road builders should apply standardization in every phase of their work. It is because of the danger that if you don't you'll "kill the goose that lays the golden egg." There are yet some 2,000,000 miles of highway in this country to be made ready for constant traffic. Costs run now from $15,000 to $60,000 per mile. A recent survey shows in 14 typical states, embracing 30 per cent of our population, an increase in cost of state government from $4.70 per capita in 1914 to $13.21 per capita in 1922, an increase of *180 per cent* in *eight* years. In six of these states, highway construction is the major cause of this increase. Borrowing money by bond issues to meet these great programs of road building simply means more taxes, not only to pay the interest but also to retire the bonds at maturity. The prospect of a heavier burden of state, county, or municipal taxes, at a time when the federal government is making a strenuous effort to reduce taxes, is not a pleasing one for the average taxpayer. The question therefore is, "How long before the pressure of the cumulative increases in food, clothing, fuel, rent and taxes will incite the average consumer and taxpayer to another 'buyers' ' strike, that will not only affect

the grocer, the butcher, and the baker, but also react on the road builder, and, back of him, the equipment manufacturer and the material producer?" Every taxpayer's dream is "more miles of good road per dollar spent." Standardization will help make his dream come true and defer the day when he would prefer to keep his money than to have more good roads.

* * *

Sand-Asphalt Road Construction Methods and Cost

BY E. R. OLBRICH
National Research Council, Washington, D. C.

ON THE first ten-mile section of sand-asphalt construction in North Carolina, a sand pit was found which gave a sheet asphalt grading. When an investigation was later made for sand for a number of other projects, it was found that the sand available was similar in all respects to the sand used on the first project except that it was uniformly much finer, practically all of it passing a 40-mesh sieve.

In order to conform to previous practice and experience in sheet asphalt construction, it would have been necessary to ship coarser sand from some distance inland to be used with the finer sand to obtain a sheet asphalt grading. This would have materially increased the cost and defeated the purpose of the sand-asphalt construction which was the utilization of local materials and low cost. The suggestion was then made that a uniform grading be maintained be-

SUBGRADE FINISHED BETWEEN TIMBER SIDE FORMS

tween the 40 and 200 meshes instead of between the 10 and 200 meshes. The results have been entirely satisfactory to date. Indeed the use of this fine sand without an admixture of coarse sand represents one of the most important developments in the sand-asphalt pavement, and is a radical departure in sheet asphalt construction.

Subgrade—An important prerequisite for the success of sand-asphalt pavement is a uniform, well-drained subgrade. This is true of any type of pavement, and is a statement so trite that it is axiomatic, but it is of prime importance in the case of the sand-asphalt pavement or any type of black base pavement. Fortunately, sand when confined offers a uniform and well drained subgrade.

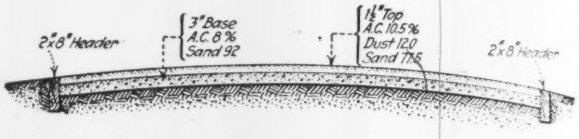
Location of Plant—The ideal set-up for the plant is a location where the road parallels the railroad and the borrow pit for sand is midway along the road. It is then possible to ship in asphalt and filler on the plant siding and to haul the sand from pit to plant by slip-teams. It is good policy to set up the plant as near as possible to the borrow pit, so as to reduce as much as possible the haul of the sand to the heating and drying unit. However, sometimes the only available sand pit is located at a distance from either the railroad or the highway, or both.

When the plant set-up is removed from the railroad, the light portable type of asphalt plant is most practical. The asphalt must be hauled in barrels and the filler in sacks to the plant.

Where the plant set-up is removed from the project it was found necessary to build a driveway or temporary road from the plant to the project over which the trucks could haul the hot mix. It is impossible to get the loaded trucks through loose sand. A 10-ft. driveway was built on one job with a base mixture 3 in. deep after compaction, at a cost of $2,500 per mile.

An asphalt storage tank equipped with heating coils should be a part of the plant. It reduces demurrage on tank cars and is assurance against running short of asphalt.

Plant Operation—The mixing operation is similar to that for the usual mixed types of pavements. The capacity of



STANDARD SAND-ASPHALT ROAD, NORTH CAROLINA

the small portable type of mixer was found to be about 700 sq.yd. of 3-in. base, or 1,400 sq.yd. of 1½-in. surface, per ten-hour day.

Hauling the Mix to the Road—Construction is started at the plant and proceeds away from the plant so that the hauling of the mix is over the finished pavement. For this purpose it has been found economical to use light, pneumatic-tired, one-ton trucks.

Road Operation—The finished pavement is being constructed either 10 ft. or 16 ft. wide. The grade is always built 30 ft. wide. It is not practicable to roll the sand fills and subgrade with a smooth drum roller, and a grooved or ring roller has been utilized to search out soft places and give a uniform subgrade.

The forms are set by a form-setting gang and are left in place after the pavement is completed to act as a protection to the edge of the pavement. After the forms are set, another small gang completes the fine grading. The forms should be solidly staked to line and grade, and the subgrade should be uniformly compacted before the base course is laid.

The base course mixture is delivered at the road at as low temperature as is consistent with proper raking and spreading, as it is necessary to delay the rolling until the base course has cooled sufficiently to permit satisfactorily

TABLE I—ITEMIZED COST OF SAND-ASPHALT ROAD CONSTRUCTION

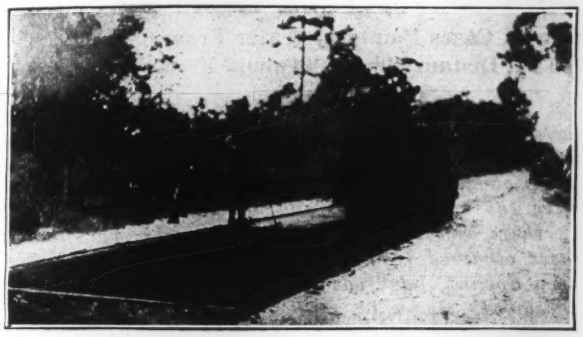
	Per Sq.Yd.
Plant operation	
Hauling sand to drier	$0.078
Labor drying sand	.027
Fuel oil used drying sand	.131
Labor mixing	.017
Asphalt in mix	.300
Dust in mix	.062
Fuel for boiler—coal, wood, lubricating oil	.040
Plant repairs, including plant engineer	.032
Railroad demurrage on asphalt tank cars	.027
Rent on asphalt tank cars	.010
Other plant labor	.076
Total	$0.810
Hauling to road	
Truck drivers' pay roll	$0.034
Gasoline and oil for trucks	.046
Repairs, including mechanic	.011
Gas, oil, and repairs road equipment	.019
Total	$0.110
Road operation	
Headers, labor	$0.028
Material in headers	.066
Fine grading, labor	.036
Laying, raking, and rolling hot mix	.108
Shoulders	.031
Total	$0.270
Incidentals	
Superintendence and timekeeping	$0.037
Depreciation, plant equipment	.029
Depreciation, road equipment	.012
Interest	.013
Miscellaneous	.....
Total	$0.090

rolling the loose raked material on the sand subgrade. The base course is laid to a compacted depth of 3 in. The rolling of both base and top course is done with an eight-ton tandem roller.

The surface course mix is laid at a temperature of 300 deg. F. to 350 deg. F. to assure a good bond between the base and surface courses. Templets are used in spreading both base and top courses, and the finished surface is checked with a straight-edge. The surface course is laid to a compacted depth of 1½ in.

The average density (i.e., relative solidity) of the base course ranges between 1.85 and 1.95. No filler is used in the base course mix. The average density of the surface course ranges from 1.95 to 2.05, seldom going beyond 2.10. The average densities of sheet asphalt laid on a cement concrete base are slightly higher than these figures, due probably to the fact that there is a certain amount of yielding or flexibility of the black base under the passage of the roller over the newly raked surface course. However, frequent cutting of samples, and its action under traffic, shows the surface course to be an exceedingly tough, dense mix.

Shoulders—With a 10-ft. pavement it is necessary for vehicles in passing to turn off the pavement. On account of the loose sand which composes the shoulder material, this has an element of danger for the thoughtless driver who does not slacken speed. Therefore, every effort is made to encourage the growth of a tough, wiry native grass as a sod on the shoulders. In some places the grass would not



ROLLING SAND-ASPHALT BASE COURSE

take hold, and clay was hauled along the edges of the pavement and mixed with the sand to act as a binder.

Cost of Pavement—Accurate cost records of the sand-asphalt pavement have been kept, and Table 1 shows figures from one of the fortnightly or semi-monthly cost reports. This report gives the cost of (1) the plant operation, (2) hauling the mix, and (3) the road operation. Any work not directly chargeable to pavement operation, such as clearing and grubbing, extra heavy fine grading, special drainage provisions, etc., is separated as extra work.

The cost of the first ten miles of sand-asphalt was $1.37 per square yard without the shoulder work. This includes allowance for interest, depreciation and overhead. The shoulder cost was about 10c. per square yard, or about $700 per mile. Of four jobs now in operation, the average cost to date varies from $1.30 to $1.80 per square yard.

The total cost of plant, camp, hauling and road equipment, and accessories necessary properly to outfit a job of this kind, is from $22,000 to $25,000. Of this about $12,999 is cost of plant equipment and accessories. If a larger type of plant is used, and larger trucks, the total cost may greatly exceed this figure.

Conclusion—The sand-asphalt pavement properly constructed on a uniform subgrade will carry an unlimited volume of passenger car traffic and pneumatic tired trucks. It is ideal for this type of traffic. If the volume of solid-tired heavy truck traffic ever becomes large on any of these roads, it will doubtless be economy to build a cement concrete pavement or base; but in the meantime the sand-asphalt pavement will have rendered many years of service at a low cost. This pavement has great possibilities of development, wherever unlimited local sand is available—along the Atlantic and Gulf Coast, in some of the lake states, and in the desert sections of the western states.

The sand-asphalt pavement is a development of practical highway research. The need of a community for economical highway service was met by the utilization of local materials. The three essentials of practical highway research are:

1. Recognition and understanding of the problem.
2. Solution of the problem.
3. Placing the information obtained in the hands of those to whom it may be of value.

* * *

Highway Traffic Accidents—Classification and Causes

By N. M. Isabella
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HIGHWAY traffic accidents may be classified under two general heads: (1) The unavoidable accident, and (2) the avoidable or preventable accident. Under the first class are those accidents which are the outcome of something which cannot be foreseen and protected against, such as defective car mechanism or some feature which is beyond the reasonable control of the car operator, in other words, those accidents which happen regardless of what precautions have been taken by drivers. Under the second class are those accidents which, if proper precautions were observed by all parties concerned, could be prevented, such as reckless driving, including speeding, passing other cars on narrow roads, driving while intoxicated, racing, glaring head-lights, pedestrians walking on heavily traveled highways, improper design and construction of roadways and roadway structures, bad alignment, insufficient protection on high and steep embankments, insufficient advance warnings of barricades or obstacles in the highway, and those due to poor and unsystematic maintenance of the highway.

The writer is somewhat familiar with conditions in the Central West and especially in Wisconsin, where we have made accident surveys for the past few years to ascertain the causes of these accidens. Figures compiled in Wisconsin are for accidents which have occurred on the state trunk highways. This mileage comprises approximately 10 per cent of the total rural mileage in the state and from traffic counts taken it is estimated that approximately 65 to 70 per cent of all the highway traffic is on this system. Reports of accidents also show that from 75 to 80 per cent of the total accidents occur on this system, due largely to the concentration of traffic. Table II shows a record of the state trunk highway accidents in Wisconsin during 1922 and 1923, and their causes. These figures were compiled from regular reports sent in by the patrolmen and other highway employees. Accidents occurring while the patrolmen were off duty were covered by news clippings sent

TABLE II—1922 AND 1923 ACCIDENTS IN WISCONSIN

	1922 and 1923	Per Cent Total
Total number of accidents	2,981	....
Number of people:		
Involved in the accident	10,258	....
Number killed	267	....
Number seriously injured	794	....
Slightly injured	2,506	....
Location of accidents:		
On straight road	2,044	68.6
At curves and corners	479	16.0
At railroad crossings	179	6.0
At cross roads	138	4.6
On hills	34	1.2
At miscellaneous places	107	3.6
Causes of accidents:		
Reckless driving	1,628	54.9
Improper or no lights	218	7.2
Broken car mechanism	151	5.0
Intoxicated drivers	154	5.1
Weather conditions	167	5.6
Car on wrong side of road	74	2.5
Narrow bridges and culverts	53	1.7
Miscellaneous causes	536	18.0

to the highway department daily. When the patrolman is hired he is supplied with a number of blanks and stamped envelopes, and as soon as an accident occurs on his section he fills in the report and sends it in to the state highway department.

At first glance, it would seem out of reason that most of the accidents should occur on straight roads, but when one considers that the great majority of highway mileage is on straight roads it is not so difficult to understand. There is also the fact that more drivers try to pass other cars on straight stretches than on any other part of the road. Reports show that the great majority of straight road accidents are due to one car trying to pass another. It is often stated by railroad officials that the straight road is more dangerous than the railroad crossing. This, of course, is not true. Considering the 1922 and 1923 accidents, we have a total of 2,981, 179 of which occurred at railroad crossings. Reports show that there was one death or serious injury to every 1.26 accidents occurring on railroad crossings and one death or serious injury to every 2.8 accidents occurring at other places on highways. In other words, the element of danger on the railroad crossings is at least twice as great as that on other parts of the highway. When we consider that the railroad grade crossings cover only a total of 3.28 miles of the 7,500 mile state trunk highway system, the ratio of accidents on grade crossings to equal distances on other parts of the state trunk highway system for 1922 were as follows: For all accidents, 148 times as numerous; serious accidents, 314 times as numerous; fatal accidents, 250 times as numerous. In 1923 the statistics are: for all accidents, 87 times as numerous; serious accidents, 28 times as numerous; fatal accidents, 407 times as numerous.

In giving these figures the writer is not attempting to justify the accidents occurring at places other than railroad crossings but is making the comparison to emphasize the necessity for grade separation on many of the crossings. Table II also shows that the great majority of accidents are due to reckless or careless driving. There are many cases listed under "reckless driving," however, which are probably due to inexperienced drivers. Each year furnishes its crop of new drivers. Altogether too many of these do their practicing on the main highways where traffic is congested, instead of taking some unimportant highway. Looking over the list of different causes, one can readily see that the great majority of smash-ups could have been avoided if proper precautions in driving had been exercised.

November Typhoid Epidemic in Part of Chicago

Elimination of Other Agencies and General Distribution of Cases Points to Water From 68th St. Crib Although District Supplied From Crib 150 Ft. Distant Almost Typhoid Free

ALTHOUGH the November epidemic of typhoid fever in Chicago cannot be traced beyond question to the water supply, every other vehicle of infection seems to have been eliminated. The majority of cases occurred in a water district supplied wholly from the 68th St. water intake crib and pumping station. Milk, oysters and ice cream, restaurants and swimming pools have been investigated with negative findings. The spot-map incidence covers too wide an area to be accounted for by any or all food supplies. The explosive nature of the epidemic, preceded as it was by an epidemic of intestinal disturbances, points to a typical water-borne mass-infection outbreak. Practically all of the different official bodies concerned — state and city boards of health, the local Department of Public Works and the Sanitary District of Chicago—have concluded that the outbreak must have been water carried. Theories as to the source of infection and why chlorine application did not safeguard the city naturally differ in detail. A representative of *Engineering News-Record* has been afforded access to the records and reports in each of the organizations just named and his own conclusions are as follows:

A heavy rainfall on Oct. 17 and 18 caused the heavily polluted Calumet River to flow into Lake Michigan. The mouth of this river is 3.6 miles due south of the Hyde Park or 68th St. intake crib, from which the 68th St. pumping station is supplied. A comparatively small contribution of sewage entered the lake from the 39th St. pumping station of the Sanitary District of Chicago, which is 4.5 miles northwest of the same crib. Heavy winds blew on Oct. 17 and 18 directly toward the crib from the Calumet River mouth and on Oct. 19 in the general direction of the crib from 39th St. Analyses were made at insufficient intervals to detect a "slug" of infectious material which by chance got into the 68th St. crib and did not enter the Dunne crib, only 150 ft. to the south (and that much nearer the Calumet).

Chlorine application at 0.3 p.p.m. was sufficient to kill all but the stronger typhoid bacilli and these attacked the least resistant of the water consumers. Comparatively, the epidemic was a light one, the attack rate being about 1 in 3,000. From Sept. 1 to Dec. 12 there were 198 typhoid cases and between Nov. 1 and Dec. 12 there were 16 typhoid deaths. The mass of the cases occurred from Nov. 10 to 27. Had no chlorine been applied, hundreds of cases would probably have developed. Had a bit more chlorine been used typhoid would have resulted from the infected water and Chicago would have continued to maintain its enviable low record which is about one typhoid case a day—largely if not wholly due to importation or personal contact.

Before giving the results of interviews with persons in authority and summaries of various reports on the outbreak, the relations of the different bodies to each other will be given. The operating division of the Bureau of Engineering in the Department of Public Works maintains and operates the chlorination apparatus but the rate of chlorine application is determined by the Health Department, orders being issued from time to time by telephone and later confirmed by letter. All bacterial and chemical tests are made by the laboratory of the Health Department, although orthotolidin testing apparatus to determine the dosage of chlorine is provided at each station and tests are made periodically by the pumping station attendants.

The Sanitary District is interested primarily in sewage disposal, which, so far as the water supply is concerned, means keeping sewage out of the lake by reversal of the Chicago and Calumet Rivers and pumping from intercepters west to the river or to the North Shore channel. Its analyses of the waters of the city or lake are mainly of a research nature. Future coordination of these three bodies will be noted later.

Department of Health—As soon as the epidemic was recognized as such Dr. Herman N. Bundesen, commissioner of health, called on the laboratory advisory committee consisting of Dr. D. J. Davis, bacteriologist,

University of Illinois, Dr. Arthur I. Kendall, dean, Northwestern University Medical School, Dr. Ludwig Hektoen, director John McCormick Institute for Infectious Diseases, and Edwin O. Jordan, professor of bacteriology, University of Chicago. This committee publicly stated that the water was probably the cause of the outbreak and strongly urged citizens to boil their drinking water and to be inoculated with typhoid vaccine.

Employees at 68th St. pumping station and crib and all who visited the crib were examined in a vain search for a possible typhoid carrier. Apparently the water was not suspected until a spot-map was made. Chlorine dosage was increased, as shown on one of the charts, about a month after the storm of Oct. 17 and 18 which caused the Calumet River to flow into the lake.

Of 116 cases investigated, 46 had eaten oysters and 70 had not. Of 118 cases, 47 had eaten ice cream and 71 had not. Three of the large milk concerns had 21, 22 and 36 cases respectively on their routes while a dozen smaller concerns served the remainder of the cases investigated. Young children were not affected. Only 3 out of 198 cases were under four years of age and the oldest was sixty-seven. From the age of 5 to 9 there were 14 cases; from 10 to 14, 14 cases; from 15 to 19, 18 cases; from 20 to 24, 32 cases; from 25 to 29, 21 cases; from 30 to 34, 29 cases; from 35 to 39, 18 cases; from 40 to 44, 15 cases; from 45 to 49, 14 cases; from 50 to 64, 17 cases.

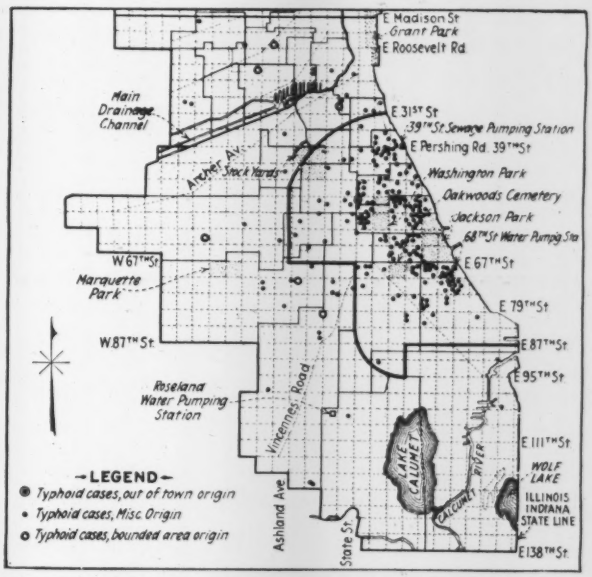
A bacterial survey by boat of the south shore was made which indicated that the entire south lake front from 18th to 79th Sts. is more or less contaminated, the greatest concentration found being opposite the 39th St. sewage pumping station. The sampling did not extend to the heavily polluted region at the mouth of the Calumet and at the sewer outlets of Indiana towns just south. Dr. Bundesen stated that he had seen a streak of floating debris extending some distance from the 39th St. station in the direction of the 68th St. crib. Conditions at this station are such, and will remain such for probably a year, during the construction of a conduit in Bubbly Creek, as to raise the level of the sewage on the suction side of the pumps. During the storm of Oct. 17 and 18 sewage, as indicated by the elevation on a recording gage, probably overflowed the top of a 10-ft. sluice gate to a depth of 6 in. These gates, now under repair, seat only one way—that is, against the lake—and therefore permit sewage to leak into the lake under a low head when a storm loads up the intercepter.

South of 39th St., lake front improvements are under way and filling has been going on behind bulkheads that are not watertight. How much floating material from this filling may have escaped is not known but after the health commissioner had met with the park officials it was reported that hereafter only "virgin" material will be permitted in this fill.

So impractical is it to control absolutely the chance pollution of the lake water that Dr. Bundesen is of the opinion that similar epidemics will be experienced. Filtration, after Chicago has metered its supply, is in his opinion the only sure remedy.

Bureau of Engineering—While the Bureau of Engineering can hardly be held directly responsible for the purity of the water so long as the Health Department controls the chlorine application, the water officials have run down every possible source of local pollution at the station and found no contributory cause. It has studied the bacterial results and found that bacterially water from the Dunne crib located within 150 ft. of the 68th St. crib, is not so good as the water from the 68th St. crib but very few cases developed in the district furnished from the Dunne crib. The chlorine dosage was applied equally to both supplies during the infection period.

After the basement of the 68th St. station was flooded with sewage in 1916 and sewage found its way into one of the pump wells, with an attendant epidemic of more than 100 cases, the conditions at this station were gone over most carefully. Tests were made of Well 4 which in 1916 had been contaminated by sewage flooding back over a low curb. Since then the curb has been raised and other improvements made to insure no backing up of sewage into the station. It was thought there might



SPOT MAP OF CHICAGO TYPHOID FEVER CASES

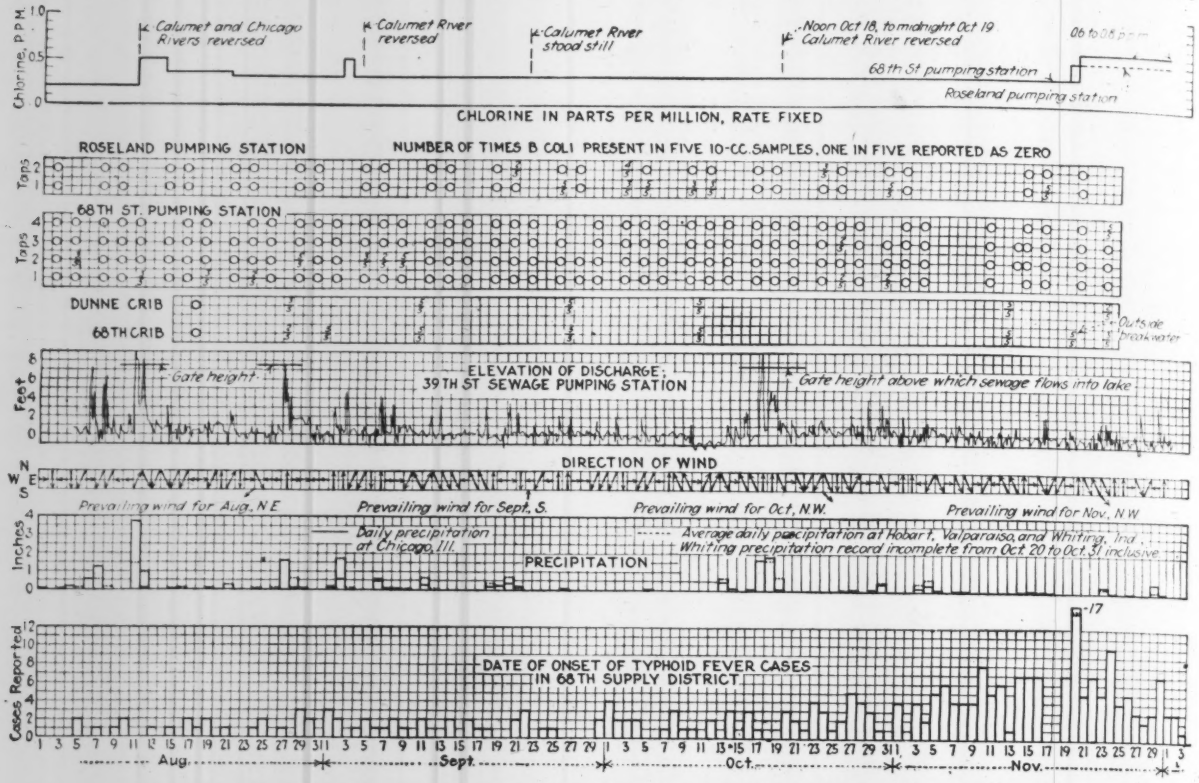
Heavy line enclosing major number of cases is the approximate extent of the district supplied from the 68th St. pumping station. Cases plotted up to and including Dec. 12, 1923.

be seepage through the wall of the well, permitting an inflow of ground water which stands about 4 ft. higher than the water in the well when the pump is operating, but the tests outlined below disclosed no evidence of such leakage. Six 4-in. holes were drilled through the floor outside the wet well and carried down into the sand to expose ground water. A saturated salt solution fed into the holes for ten hours did not get into the well as evidenced by chemical tests every 30 min., and readings every 5 min., on a millivoltmeter.

Chlorine dosage, as ordered and applied, checks in all cases remarkably close and there is no indication that any accident affecting chlorination occurred during the infection period. The chlorine is applied on the discharge side of the pumps. The chlorine pumps are started simultaneously with or even before the water pumps. Only a few samples for bacterial analysis are taken at the crib but samples are taken from taps after chlorination three times a week. No samples are taken from the wet wells at the pumping station to detect possible contamination of the water during its passage from the intake crib to the pumping station but arrangements will be made to do this. There is no record of leaks into any of the Chicago tunnels and that possibility is heavily discounted.

Significant of the way in which future epidemics may be minimized is the following statement in a report by John Ericson, city engineer, to Col. A. A. Sprague, commissioner of public works:

The chart plainly shows that the present method of varying the chlorine dosage is wrong in that the remedy is put into effect after the damage is done. If possible the chlorine


Chlorine, P.P.M.
Calumet and Chicago Rivers reversed
Calumet River reversed
Calumet River stood still
Noon Oct 18, to midnight Oct 19 Calumet River reversed
68th St pumping station
Roseland pumping station
CHLORINE IN PARTS PER MILLION, RATE FIXED
ROSELAND PUMPING STATION
NUMBER OF TIMES B COLI PRESENT IN FIVE 10-CC. SAMPLES, ONE IN FIVE REPORTED AS ZERO
Taps
68TH ST. PUMPING STATION
DUNNE CRIB
68TH CRIB
Outside fresh water
Feet
Gate height
ELEVATION OF DISCHARGE, 39TH ST SEWAGE PUMPING STATION
Gate height above which sewage flows into lake
DIRECTION OF WIND
Prevailing wind for Aug., N.E
Prevailing wind for Sept., S.
Prevailing wind for Oct., N.W.
Prevailing wind for Nov., N.W
Inches
Daily precipitation at Chicago, Ill.
Average daily precipitation at Hobart, Valparaiso, and Whiting, Ind.
Whiting precipitation record incomplete from Oct. 20 to Oct. 31 inclusive
PRECIPITATION
Cases Reported
DATE OF ONSET OF TYPHOID FEVER CASES IN 68TH SUPPLY DISTRICT
Aug.
Sept.
Oct.
Nov.

CHICAGO TYPHOID EPIDEMIC STUDY AS MADE BY THE SANITARY DISTRICT OF CHICAGO

The typhoid case onset dates are given for the area of the city supplied from the 68th St. intake crib and 68th St. pumping station, in which the outbreak was located. Such B. Coli counts as are available, as well as rates of chlorine application, are given for both the 68th St. supply and for water drawn from the Dunne crib, located only 150 ft. from the 68th St. crib, and delivered by the Roseland Ave. pumping station to a district free from typhoid, lying south and west of the area supplied by the 68th St. pumps. Calumet River flow reversals, overflows to the lake from the 39th St. sewage pumping station, rainfall depths and wind directions are shown for reasons made plain by the text. See also data on case spot map and wind resultant map. Comparatively few B. Coli were reported as 0 in 5 even though one in five tubes was positive because (so the laboratory workers state) the Treasury standard passed a 1 to 5 as satisfactory. The small number of bacterial counts reported for water taken at the cribs is notable.

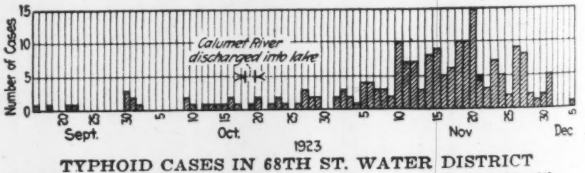
should be used as a preventive measure and not as a curative one. From the chart it is seen that the chlorinated water is sampled every other day and then it takes from 24 to 48 hours to analyze the samples. If on a particular day the water were contaminated it could spread typhoid for a whole day before the danger would be known.

I believe it would be better to so dose the water at all times that there would be a fixed amount of residual chlorine. In this way the water would always contain all the chlorine it would absorb and would always be sterile. The regular operating force at the station should make orthotolidin tests every hour and change the dosage when necessary to maintain the fixed amount of residual chlorine. By this method contaminated water could never be pumped for more than one hour without being detected.

Sanitary District of Chicago—Interest for the Sanitary District in this epidemic centers around both the 39th St. pumping station and the Calumet River. By comparing elevations of six readings of a gage at Wildwood, nine miles upstream from the mouth of the Calumet, with a recording gage of lake levels maintained by the U. S. Coast Guard near the mouth of the Chicago River, it is estimated that the Calumet flowed into the lake for 36 hours, from Oct. 18 at noon to midnight of the following day. At 39th St. a level-recording gage in the sewage intercepter indicated about four hours' flow over the top of a sluice gate 10 ft. long.

The Calumet River pollution is augmented by the discharge of sewage and an enormous load of industrial waste into the lake from the Indiana towns immediately south, Whiting and South Chicago. The mouth of the Calumet is 3.6 miles from the 68th St. crib and the 39th St. station is 4.5 miles distant. On Oct. 17 and 18 there was a precipitation of 1.66 and 1.81 in. respectively. This rainfall was much heavier than reported at Chicago.

Direction of the winds on the critical days has been plotted with the length of the arrow-headed lines repre-



TYPHOID CASES IN 68TH ST. WATER DISTRICT

Definite dates of onset as determined and plotted by Health Department.

senting the velocity times the period the direction was maintained. No float measurements have been made to ascertain what current in the lake water may have been produced by the wind, but experiments on this line are

contemplated, Langdon Pearse, sanitary engineer, states: A low wind-induced water velocity would bring sewage-laden waters to the cribs in a few hours from either the Calumet River or the 39th St. sewage pumping station, though the great volume from the Calumet region would probably prove to be the least diluted.

A bacterial survey from a boat, similar to that undertaken early in the investigation by the health department, has been made by the Sanitary District. It shows pollution near 39th St. but by far the heaviest pollution was found offshore in the Calumet region.

Another activity is directed toward the perfection of some kind of an indicator which will show automatically the direction of flow. These instruments are to be installed in the Calumet and in the Chicago River (the latter flowed into the lake for six hours following a heavy downpour on Aug. 11). The Sanitary District officials believe information of this kind transmitted to those in charge of the chlorinators would enable the latter to meet the situation.

Bulkheads over the gates and repairs at the 39th St. station are being made. Further pumping capacity may be added to keep down the elevation of sewage in the intercepter but the engineers feel that the sewage escaping is not large enough to warrant too much refinement until the great volume of flow from the Calumet is more adequately taken care of. A movement is on foot to move the 39th St. station inland but the whole sewer system of the tributary area is so old, inadequate and in need of revamping that the pumping end of the problem should not be decided until the plans for contributing sewers are determined. Whether Chicago is restricted to 4,167 sec.-ft. diversion from the lake is a factor, for the pumps at 39th St. normally use lake water to flush Bubbly Creek.

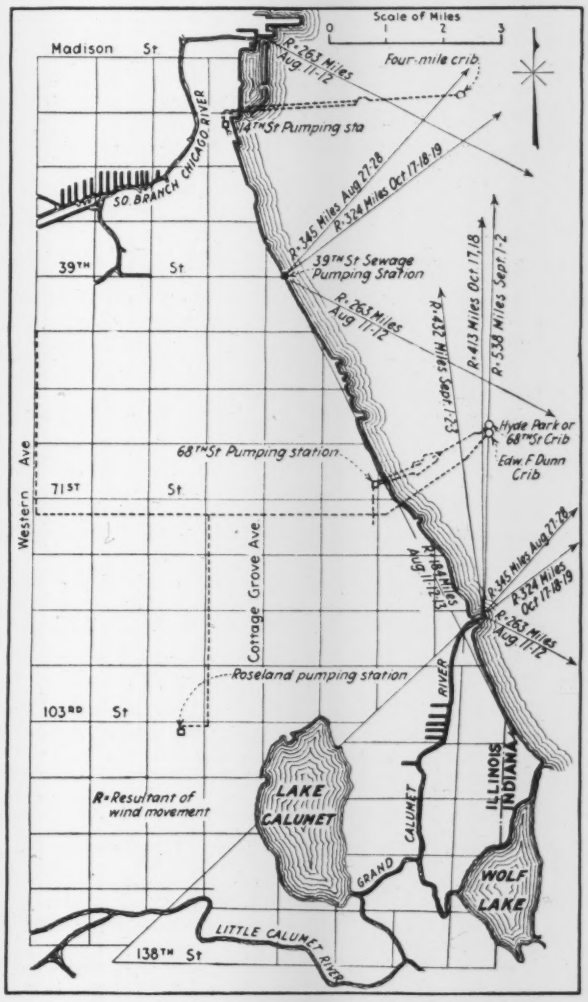
State Board of Health—Following an exhaustive investigation of all possible causative factors by two sanitary engineers of the State Board of Health, a comprehensive report has been made. A water-borne mass-infection epidemic, mild in character (1 in 3,000), caused probably by pollution due to the Calumet reversal Oct. 18 and 19, was the finding. Not enough samples were taken to detect occasional pollution. A possible total 8-min. period of non-application of chlorine after starting the pumps was noted. Primarily the blame is placed on lax operative methods and on insufficient co-operation between those in control of ordering the chlorination dosage and those handling its physical application, plus a lack of co-ordination between those responsible for the chlorine dosage and those who should have knowledge of unusual pollution due to reversals of the Calumet and Chicago Rivers or such minor pollution as may escape from the 39th St. sewage pumping station.

The recommendations of H. F. Ferguson, chief engineer, concurred in by Dr. Isaac D. Rawlings, director, are abstracted below:

1. There should be established unified and complete sanitary control of the public water supply in the city water department. There could be check analytical and epidemiological control by the city health department.

Such unified and complete sanitary control in the water department should be under a competent sanitary and hydraulic engineer who should not only be conversant with hydraulics and mechanical equipment used in water-works stations, but thoroughly understand (because of education, training and actual experience) bacterial, chemical, biological and physical analyses of water and be qualified to make or direct such tests and interpret the results. The sanitary engineer should have directly under his supervision a bacteriologist and chemist and such other assistants as are needed. All other employees in the water department who may have duties where the sanitary quality of the water may be affected—such as in the operation of pumps, chlorinators, etc.—should be required to carry out promptly and exactly any instructions given verbally or in writing by this engineer.

A competent sanitary and hydraulic engineer in charge of water-supply control would be able not only to maintain better supervision and operation of the chlorinating equipment and analytical determinations than have been maintained in the past, but would make studies of the algae and



RESULTANT WIND MOVEMENTS DURING CRITICAL PERIODS PRECEDING CHICAGO TYPHOID EPIDEMIC

Length of arrow-headed lines equals velocity times period the direction was maintained.

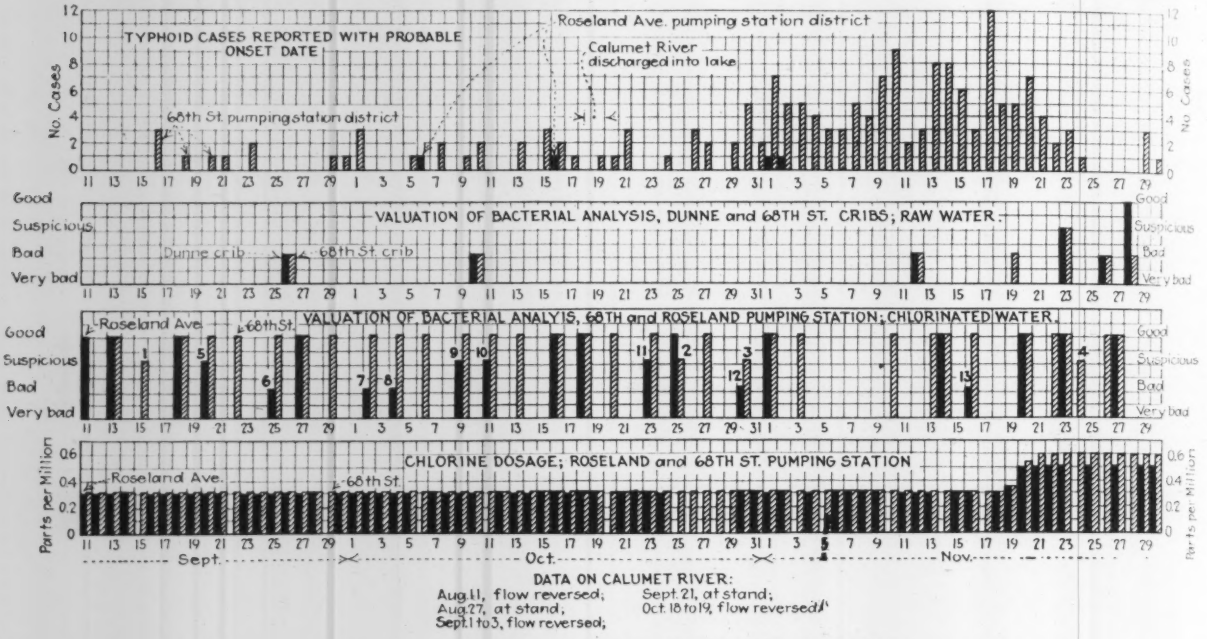
organic content of the lake water and carry out studies to counteract any resulting tastes and odors. He would also make studies and maintain complete information about all sources and points of pollution of the lake from the Wisconsin-Illinois state line to at least the Indiana-Michigan state line. Such complete and thorough knowledge of the physical conditions that may affect the sanitary quality or appearance of the public water supply would enable him to plan to take care of any conditions that might arise and thus constantly maintain the water supply of safe sanitary quality.

It would be one of the duties of such an engineer to perfect an arrangement with the Sanitary District of Chicago so that constant information relative to the sewage-pumping stations would be available to him. He would also have

supervision over the dumping of excavated material and other waste material in the lake insofar as such affects the sanitary quality of the water.

2. Consideration is suggested of a unified water department having bureaus of (a) design and construction, (b) operation, (c) sanitary control, (d) distribution system and (e) finance, all, excepting finance, having engineers at their head reporting to a director.

3. The engineer in charge of the sanitary control should maintain complete knowledge of all possible sources and avenues of pollution of the water and be prepared to treat



TYPHOID EPIDEMIC STUDY BY BUREAU OF ENGINEERING
Shows few cases in Roseland Ave. compared with those in 68th St. water pumping district.

NOTES ON BACTERIAL RESULTS

68th St. Pumping Station

(1) Taps Nos. 1, 2 and 3 good; No. 4 suspicious.
(2) Tap No. 1 suspicious; Nos. 2, 3 and 4 good.
(3) Tap No. 1 suspicious; No. 2 good.
(4) Taps Nos. 1 and 2 suspicious; Nos. 3 and 4 good.
On Sept. 4 Taps Nos. 1, 3 and 4 good; No. 2 suspicious.
On Sept. 6 Taps Nos. 1, 3 and 4 good; No 2 fair.
On Sept. 8 Tap No. 1 good; No. 2 bad; No. 3 fair; No. 4 suspicious.

Roseland Pump Station

(5) Tap No. 1 good; No. 2 suspicious.
(6) Tap No. 1 bad; No. 2 good.
(7) Tap No. 1 suspicious; No. 2 bad.
(8) Tap No. 1 bad; No. 2 good.
(9) (10) (11) Tap No. 1 suspicious; No. 2 good.
(12) Tap No. 1 bad; No. 2 good.
(13) Tap No. 1 bad; No. 2 suspicious.

the water supply so as to take care of such pollution at all times. He would also work to have as much of the pollution as possible removed.

4. The sanitary engineer would direct and supervise the making of all analytical determinations both on the raw and treated-water.

5. Improved arrangement for the application of chlorine should be made. The chlorine should be discharged into the suction side of pumps wherever possible and check should be made to insure proper diffusion of the chlorine so that the water drawn by all pumps will receive equal dosage. As an instance of improper diffusion may be mentioned the conditions now prevailing at the Roseland station.

6. The station operating engineer in charge of each "shift" at each pumping station should be authorized to increase the chlorine dosage immediately at any time the turbidity or the orthotolidin tests indicate such to be necessary in order that the water as it leaves the pumping station may carry the required "free" chlorine. Notification of such change in chlorine dosage would be reported by telephone as promptly as possible to the sanitary engineer in charge of the sanitary control of the water supply. No operator or station engineer would have authority to decrease the chlorine dosage even though it had been temporarily increased by himself. A decrease in chlorine dosage would be made only under direct orders from the sanitary engineer.

7. All bacterial and other analytical determinations and procedure should be made in accordance with "Standard Methods" of the American Public Health Association. Research by the sanitary engineer and laboratory personnel under his supervision should be encouraged. Research studies on the turbidity of the lake at different times and the chlorine dosage needed to give a safe water will serve as a guide for routine control. Research studies can also be carried on to help take care of algae and the pollution entering the lake, especially the phenol compounds from Northern Indiana.

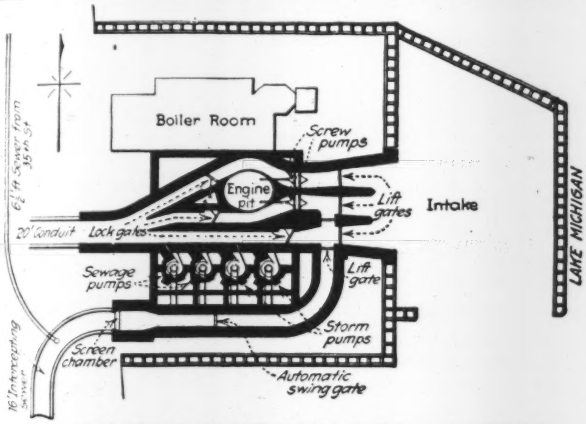
8. Consideration should be given to the installation of filters to clarify and purify the water before chlorination. It cannot be expected that filters will be installed in the very near future, but undoubtedly filters will eventually be installed in Chicago in order to maintain a water of pleasing appearance and the highest possible sanitary quality. The installation of filters will not be practicable until wastage has been reduced by the installation of meters on all service connections.

Certain portions of the report indicating the seriousness of purpose of the investigators and their thoroughness are noted in the ensuing paragraphs. The report strikingly compares the mildly recorded epidemic causing 16 deaths with the widely advertised Twentieth Century wreck which killed but 9 people. As typhoid epidemics are even more preventable than train wrecks the state board officials believe that they should be regarded with even more interest, investigation and improvement.

Difficulties with the application of chlorine to the suction pipe are noted as follows:

The longest chlorine-solution-feed hose line is about 225 ft. long. In putting in operation a high-service pump it is the practice for one man to start the high-service pump and a second man to start the chlorine-solution pump immediately when it is known that the high-service pump has been primed and is operating. The discharge from a high-service pump automatically starts a chlorinator, but each solution pump is manually operated and, therefore, there may be a slight lag in the application of chlorine.

When a chlorinator and chlorine pump are shut down it has been the practice to flush out the chlorine-solution jar, the chlorine-pump cylinders and the discharge hose line to the high-service pump in order not to let the strong chlorine water remain in them. Because of the capacity of the solution jar and the hose line it is figured that it takes two minutes for the chlorine solution to displace the water and thus reach the discharge from the farthest high-service



INTAKE, WATER CHANNELS AND WELLS AT 39TH ST. SEWAGE PUMPING STATIONS

Normally water can flow from the lake by gravity through the station. Because of construction the sewage has to be pumped to a discharge level higher than the lake level. The drawing indicates the easy path of sewage through gates seating against a high lake level rather than a high sewage level. In the storms of August and October the sewage rose above the top of the sluice gates and flowed into the lake.

pump after the chlorinator and chlorine-solution pump have been started. Therefore, there would be a lag of at least 2 min. in the application of chlorine.

During Oct. 18 and 19 high-service pumps were started four times and, therefore, at that time, when the water was carrying slightly increased pollution, there were at least 8 min. and probably more when some of the water was not receiving chlorine. Also on Oct. 19 there apparently was some trouble with chlorine Pump 3 and a shift had to be made to one of the auxiliary units and this may have also caused a short period when the water from Pump 3 was not chlorinated.

The analytical control, the report states, was inadequate to check the sanitary quality of the water to prevent contaminated water reaching the consumers and to utilize well-recognized means of exercising control. Quoting again:

The bacterial analyses were made by the city health department on samples collected by employees of that department. The frequency [infrequency seems to be a more fitting word—EDITOR] of such analyses is indicated by the fact that samples were collected on 13 out of 56 days during October and November at the Roseland Ave. station and on 21 days out of 56 days at the 68th St. pumping station. Raw-water samples were collected and analyzed on three days during October and November for each of those two stations. The bacterial analyses have not been completely recorded. The orthotolidin tests for chlorine in the water as discharged from the pumping stations were not made more than once each "shift" or three times a day at any station and until the first part of December, following the epidemic, were not made at all at the 68th St. station and possibly at others. The orthotolidin test for free chlorine, which is the present recognized best method for immediate control of chlorine dosage, was thus not utilized and also turbidity tests of the raw water were not made in order to help control the chlorine dosage.

The organization or arrangement for the sanitary control of the water supply is called unsatisfactory and not such as to provide every reasonable means and method for maintaining a safe sanitary quality. The nature of the divided responsibility is noted as follows:

The city health department has had the authority to specify the chlorine dosage and also to collect samples and make bacterial analyses. The duty of the water department has been to maintain the chlorination equipment and to apply the chlorine at the dosage ordered by the health department. The orthotolidin tests presumably were to be made by a representative of the city health department, but none were made at the 68th St. station. The control of dumping of dredge material, etc., has been under the chief dredging inspector of the city health department. There has been no provision made for regularly and constantly keeping track of and recording sources and amounts of pollution entering the lake, such as at Calumet River, the 39th St. pumping station, the sewer outlet of the Illinois Steel Co., and outlets from Northern Indiana communities and manufacturing establishments [nor has provision been made for recording rainfall, wind and other factors that may influence the quality of the raw water.

It has been the practice for the water office to send daily a summarized statement to the city health department giving the amount of water pumped, the chlorine used and the rate of dosage in order that the health department might know the actual dosage and whether or not it conformed to the orders of that department. No check has been made by anybody in the water or health departments to see that the chlorine-solution pumps were operated uninterruptedly at the same time as the high-service pumps. Such data are available on the log sheets from the different pumping stations but as far as could be ascertained were not checked over with that particular object in view.

There has been no provision made for a member of the city water or health department to regularly and systematically keep in touch with the conditions at the Sanitary District pumping stations nor for the district officials or its employees regularly to keep the water or health departments advised as to conditions. There has been notification given to the water or health departments at times of very exceptional conditions, but not at every change in conditions that might affect the quality of the lake water.

Colorado's Highway Work for 1924

There is available $4,725,000 for highway work within Colorado during 1924. The chief engineer and advisory board have submitted a report to the governor and with his approval the money will be spent as follows:

HIGHWAY APPROPRIATIONS, COLORADO, 1924

Maintenance	$811,000
Construction purposes, federal aid projects	3,000,000
State projects	500,000
Property, equipment, administration and surplus war materials	264,000
Contingencies	150,000

ESTIMATED RECEIPTS FOR HIGHWAY WORK, COLORADO, 1924

Balance of 1923 highway fund	$300,000
One-half mill levy	750,000
One-half of 2-cent gasoline tax	575,000
Internal improvement	50,000
Sales to counties and miscellaneous	50,000
1924 bond sale to meet federal aid	1,500,000
Federal aid projects	1,500,000
Total	$4,725,000

Engineering Literature

A MONTHLY REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

How to Use a Handbook

BY R. FLEMING
American Bridge Company, New York City

The handbook presupposes a certain amount of knowledge on the part of the user. Ketchum states in the Preface to his Structural Engineers' Handbook that the book is written for the structural engineer and for the student or engineer who has had a thorough course in applied mechanics and the calculation of stresses in structures. Henck in the Preface to the first edition (1854) of his Field-Book for Engineers states that it was no part of his design to furnish a column of mere rules professing to require only an ability to read for their successful application. "Rules," he says, "can seldom be safely applied without a thorough understanding of the principles on which they rest." This fact can not be too strongly emphasized.

What should be constantly remembered by all users of handbooks is that even when these books are thoroughly up-to-date when printed they do not long remain so. Industrial processes are constantly changing. The longest transmission line or the highest chimney of today is the second or third of tomorrow. One of our steel handbooks devotes 20 pages to extracts from the building laws of 30 cities. The section was compiled with great care but the book was hardly in circulation before the floor loadings and other data given for buildings were superseded in one or two cities. It is not safe for an architect or an engineer to assume that the requirements of a city regarding buildings therein as given in any handbook are correct. All information obtained therefrom should be verified by reference to the building code itself *and all amendments thereto.*

The text of a handbook should be carefully read before being followed, especially all explanatory notes relating to tables and formulas. This is not always done. The writer has been called upon at different times to determine why certain beams used for crane girders were weak. In every case the safe loads given in the tables of some steel manufacturers' handbook had been used without any attention to the explanatory note that these tabular loads hold good only when the compression flange of the beam is secured against lateral deflection. The table of reductions to be followed in case the beam is not so secured, invariably given in the steel handbooks, had been ignored.

Care should be exercised that formulas are thoroughly understood before using. One college professor said that he never allowed a student to use a formula unless he knew how to derive it. Though this might do for the student it can not be insisted upon for all users of handbooks. For instance, the deflection formulas for loaded beams can be safely followed with but little knowledge of their derivation. In all formulas it is important that the units be assumed of the proper denomination. The amateur in the use of formulas needs to learn this as his first lesson. (Probably more errors occur from the violation of this rule than from any other cause.) Thus, in the deflection formula,

$$D_{max.} = 5Wl^3 \div 384EI,$$

for beams supported at ends and uniformly loaded, if the maximum deflection is sought in inches the length l must be taken in inches. In the flexure formula, $M = f\frac{I}{c}$, since f, c, and I are in inches the bending moment, M, is in inch-pounds.

It should be clear before using a selected formula that it is adapted to the case in hand.

Abuse of the handbook consists mainly in putting it to uses for which it was not intended. This is usually done by those not qualified to use it. The handbooks of the half-dozen steel manufacturers are excellent in all that pertains to the strength of columns, beams and girders, but the steel framework of a building can seldom be successfully designed from only the knowledge supplied by the handbook. For all but the simplest cases there is needed a training in both the principles and practice of design.

In conclusion, the modern handbook is a mighty instrument for service but woe unto the man who is its slave. In an unguarded moment it will fail him.

Foundations

REVIEWED BY C. S. RINDSFOOS
Secretary-Treasurer, Jarrett-Chambers Co., Inc., New York City

FOUNDATIONS, ABUTMENTS AND FOOTINGS—Compiled by a staff of Specialists; Editors-in-Chief: George A. Hool, S.B., Consulting Engineer, Professor of Structural Engineering, University of Wisconsin, and W. S. Kinne, Professor of Structural Engineering, University of Wisconsin, Assisted by Horace S. Baker, S.B., Chief Engineer, Frank D. Chase, Inc., Chicago. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in.; pp. 414; illustrated. $4.

The book under consideration is the third which has appeared in recent years and in which the authors endeavor to cover completely the subject matter embraced by the title, in addition to a fourth one of elementary character. Inasmuch as the writer had the pleasure of reviewing the other three books (*Engineering News*, June 18, 1914, p. 1389, and Nov. 19, 1914, p. 1044) he finds it difficult to describe this one without comparison. It is divided into eight principal divisions, namely Soil Investigation; Excavation; Caisson, Cofferdam and Pile Foundations; Spread Footings; Underpinning; Special Foundations; Bridge Piers and Abutments; and Legal Provisions. In its preparation the authors, or editors-in-chief, have had the assistance of fourteen associates who have prepared chapters or subdivisions on special subjects.

While the subject matter is the same as in the case of at least two of the other books mentioned, the approach is different. In Fowler's Practical Treatise on Sub-Aqueous Foundations, the ground was covered by the inclusion of innumerable descriptions and pictures illustrating actual experiences on the part of the author and others. Jacoby and Davis gave less in the way of

actual experience and more of theory, though they gave both. Malverd A. Howe, in a short textbook on ordinary foundations, confined himself entirely to fundamental principles which he treated in an elementary manner. The book in question treats the subject from the theoretical point of view and gives very few actual cases except as to costs and photographs. In the opinion of the writer, the Fowler book will perhaps best serve the practical designer and construction man; the Hool and Kinne and the Howe works will find greatest favor in the classroom; and the Jacoby and Davis book will, in a measure, cover both fields.

The writer believes that the time has passed when the subject of foundations can be adequately covered by one author and in one volume, any more than could the subject of superstructures be contained in the covers of one book. The Fowler book has some eight hundred pages, almost as many as the other three combined, and yet it does not, in the writer's opinion, contain all that could be desired. Also, as would naturally be expected, each book contains a much fuller treatment of some subdivisions than of others, so that it would depend on the particular type of foundation in which the reader might be interested, and it would depend on whether the reader were interested from an elementary, design, or construction viewpoint, as to which of these works would best serve him. While believing that every engineer would do well to include all four in his library, and while three at least will serve very well in the classroom, the writer looks forward to the publication of a complete treatise in several volumes. In editing such a work the editor-in-chief will be well advised to select carefully as his associates men who have had experience in design and other men who have had experience in executing work. These men should be specialists and leaders in their respective fields, which has not always been the case with the books which have thus far appeared. Finally, the work should be presented so as to distinguish clearly between theory and practice, design and construction, office and field.

Electrical Temperature Instruments

REVIEWED BY C. O. FAIRCHILD
Bureau of Standards, Washington, D. C.

ELEKTRISCHE TEMPERATUR-MESSGERÄTE — Von Dr.-Ing. Georg Keinath. Munich and Berlin: R. Oldenbourg. Paper; 7x10 in.; pp. 275; 219 figures in the text. Paper, $2.40; cloth, $2.65 (both in Germany).

This book on Electrical Temperature-Measuring Instruments by the author of a valuable German monograph, Technik der elektrischen Messgeräte, can be no less valuable than the older book to the practical engineer who wants reliable information in pyrometry, high-temperature thermometry and gas analysis. The author is evidently an active engineer and wastes little space in useless theory. The book is written in a concise, straight-forward style and makes easy reading. There is a more or less successful attempt to compare various instruments of different manufacture but the information is of particular value only to the German, because foreign makers of instruments did not supply the author with sufficient material for his book. In fact the book is of secondary value in America on that account. This does not detract from its value as a book of reference in which we can find many good methods not much used in this country. The physical and engineering data are generally good but some of the material is questionable and not carefully selected—if one wishes to be exact.

There is excellent treatment of available accuracy of measurement by different instruments. No engineer will fail to realize the uncertainties to be met with in practice after reading this book.

The modern American development of automatic temperature control of heat treating furnaces is only touched upon, for the author is not familiar with American practice. He has referred, however, to English publications and quotes frequently from Burgess-Le Chatelier and Bureau of Standards Technologic Paper T 170 and from similar publications in English. Keinath is more familiar with the details of construction of electrical instruments than any of the authors just mentioned and has included in his work sections on temperature measurements in generators, motors, transformers, etc.

The book is not intended for a laboratory manual and does not cover the field of calibrating, checking and standardizing methods in temperature measurements.

On Making Diagrams

THE DESIGN OF DIAGRAMS FOR ENGINEERING FORMULAS AND THE THEORY OF NOMOGRAPHY—By Lawrence I. Hewes, B.Sc., Ph.D., M. Am. Soc. C. E., Deputy Chief Engineer, U. S. Bureau of Public Roads; and Herbert L. Seward, Ph.B., M.E., M. Am. Soc. M. E., Associate Professor of Mechanical Engineering, Sheffield Scientic School, Yale University. New York and London: McGraw-Hill Book Co. Cloth; 9x12 in.; pp. 111; 83 diagrams, many full page. $5.

The making of diagrams is a most important part of the engineer's work, but it is a part which is not as adequately treated in engineering schools as it should be. Practising engineers, therefore, will welcome such a clear and complete statement of the practice and principles of diagram making as has been given by Messrs. Hewes and Seward. The transposition of equations into curves and vice versa and the solution of formulas by diagrams are both quite adequately treated, and the diagrammatic presentation made very clear by the use of a larger page than is normal in technical books.

Overhead Costs

STUDIES IN THE ECONOMICS OF OVERHEAD COSTS—By J. Maurice Clark, Professor of Political Economy, University of Chicago. Chicago: The University of Chicago Press. Cloth; 6x9 in.; pp. 502. $4.

The author describes this book in his Preface as a volume of research into the principles of dynamic economics, a study of the discrepancies between supply and demand which result in waste, partial idleness, and many other economic disturbances, and of costs which cannot be traced to units of output or do not vary with the output. After discussing the general features of overhead cost and the laws of return and economy, the book deals with more specific cases, such as overhead costs on railroads, the transportation system as a whole, and public utilities. This is followed by discussions of labor, government, and cut-throat competition as overhead costs and the relation of overhead costs to the laws of value and distribution. Valuable features of the book are footnote references to the sources of much of the material presented and to supplemental reading on problems of overhead cost.

Many-Sided Life of a Great Sanitarian

MEMOIRS: With a Full Account of the Great Malaria Problem and Its Solution—By Ronald Ross. New York: E. P. Dutton & Co. Cloth; 6x9 in.; 11 plates. $9.

The world has long owed Colonel Ross a great debt for the persistent work by which he proved that malaria is spread from man to man by mosquitoes and—not stopping there—went into the field of applied sanitation and used the knowledge to control mosquito breeding, reduce malaria and point the way to other victories. To this debt Colonel Ross has now added another. He has written a consecutive well-referenced account of his contributions to the solution of the "great problem" of mosquito control, prefaced, interwoven and followed with the main currents of his life, including his part in the Liverpool School of Tropical Medicine after his return from his many years as an officer in the Indian Medical Service, the award to him of the Nobel Prize in Medicine, and an outline of his work during the late war.

The book is addressed to the "general reader" as well as to "medical men." In fact, it is largely an appeal to the "layman" to make it possible to reach the malaria reduction goal to which the author pointed the way in 1899, since it is laymen "and not doctors, who rule the world." Most of the volume will be readily understood by any intelligent general reader and if any such readers find the book too technical or too detailed in the many chapters on malarial research they can do considerable "skipping" without losing the main and easily followed thread.

Besides the detailed and entertaining story of his malarial researches and sanitary work, in which hosts of people are interested, the book has a broad appeal because throughout his life Ronald Ross has been a many-sided man of vision—a keen, persistent and fruitful scientific investigator; a practical sanitarian; a zealous humanitarian; and a good fighter, both to achieve ends and to defend his credit for doing so against later claimants. The book has a strong appeal to specialists in preventive medicine, in mathematics, philosophy, literature and music.

The author's long chronological list of his writings on malaria is interspersed with his essays in mathematics and is followed by fifteen items of "Printed Literary Works by R. Ross." Most of these are poems or dramas but there are two or three romances. Bits of verse are in evidence throughout the book. It is unnecessary here to pass on the merits of either the mathematical or literary efforts but even though neither prove to be of more than passing interest, except the application of the laws of probability to infection, they were nevertheless essential to the daily life of the author. One cannot read the verses embodied in the author's accounts of his triumphs, his despairs, and his sympathy for the Indian natives, without feeling that here was a man of vision and devotion, expressing both through research, human sympathy and poetic frenzy. Doubtless these, with the author's early musical compositions and the long sustained mathematical flights, were all akin.

A quotation from the author's chapter on how he put down cholera in the native quarter of Bangalore, India, will serve to show that the author could write vigorous prose, and will give the reader of this review a chance to form his own opinion as to Colonel Ross's verse:

I should like to take the politicians who so often belittle and neglect sanitation and medical science—I should like to take them by the scruff of the neck and fling them into the midst of an Indian outbreak of cholera, and into the midst of the filth and dirt which their bad laws and feeble administration allow to continue! . . .

Above all it was necessary to organize refuse-removal on the cheapest and most efficient basis possible (there were no house-sewers) and day after day I accompanied the scavengers and sweepers in their early and disgusting work—sometimes rising before daybreak to do so—in order to learn exactly how an Indian city was to be kept clean and what improvements should be made. These experiences are not easily forgotten—the glorious stars glittering in the chill morning wind, the murky lanterns, the clinking pails, the patient oxen, the awful stenches. And the poor men themselves, the last pariahs and outcasts of society, toiling while others slept; and yet, in a way, the civilization of the thronged cities was based upon their labor. Thank heaven I was able to increase their pay and give them good lanterns, at least.

Great is Sanitation—the greatest work, except discovery, I think, that a man can do. Here is a city seething with filth and disease. What is the use of preaching high moralities, philosophies, policies, and arts to people who dwell in these appalling slums—sometimes whole families of them crowded into one cell, mixed with cattle, vermin, and ordure? Your job, Sanitarian, is plain! You must wipe away those slums, that filth, these diseases. You shall work in the darkness while others sleep. None shall know of your labor, no one shall thank you, you shall die forgotten. The great ones of the earth shall despise you, shall hamper you, shall even punish you. The lofty rulers of the world shall not deign even to look at you; but shall prate of gods and virtues, liberties and laws, and shall busy themselves pouring the wine of wealth from one vessel into another, drinking much by the way, and spilling more! But you, O Cleanser, shall always be a Pariah. Fret not, however; for these dying children shall live, and some day this hideous slum shall become a city of gardens, and it is you who will have done it.

We shall reach the higher civilization, not by any of the politicians' shibboleths, methods of government, manners of voting, liberty, self-determination, and the rest, all of which have failed—but first by the scientific ordering of cities until they are fit for men of the higher civilization to dwell in. We must begin by being Cleansers.

I find the following two stanzas in my notebooks:

"Ascend," the Prelate cries,
"From Men to Angels." "Then
First learn," the Sage replies,
"To grow from Apes to Men";

We cry, "God, make us Kings,
Poets or Prophets here!"
The scornful Answer rings,
"First be My Scavenger."

Two verses on "Indian Fevers" illustrate further the author's sympathy for suffering humanity, individual and en masse, and his prayerful devotion to finding "The unseen, small, but million-murdering cause":

In this, O Nature, yield I pray to me,
I pace and pace, and think and think, and take
The fever'd hands, and note down all I see,
That some dim distant light may haply break.

The painful faces ask, can we not cure?
We answer, No, not yet; we seek the laws.
O God, reveal thro' all this thing obscure
The unseen, small, and million-murdering cause.

Such expressions as the foregoing should stimulate both the scientist and the sanitarian to renewed devotion to their work and should help bring to their support the bureaucrats, whose indifference and inefficiency Colonel Ross so frequently deplores, and the great body of "laymen" who, as the author says, "rule the world."

British Railway Amalgamation

RAILWAY AMALGAMATION IN GREAT BRITAIN—By W. E. Sinnett, M.B.E., Assoc. Inst. C. E., Railways Amalgamation Tribunal, Late Director, Ministry of Transport. London: The Railway Gazette. Cloth; 6x9 in.; pp. 276; four maps in text and many tables. 15s. net.

This book is not the dry reading that the title would indicate, for the author in working up a background for his description of the amalgamation of the 120 railways of Great Britain into four great systems takes the reader back to the time, almost a century ago, when railroads were little more than a curiosity in England and traces for him in an interesting way the growth of those few early railways into the numerous companies as they existed on Aug. 4, 1914, when the government took over the operation and control of the railways as a war measure. In doing this, the author deals largely with the legislation affecting the railways, particularly with that of the years immediately preceding the war, when the subject of amalgamation was being discussed. Yet all these details, as well as the details in the succeeding chapters, are so worked together that interest in the narrative is maintained. Whenever it is necessary to quote agreements and figures or to refer to legislation, the material is placed in appendices. This makes it unnecessary to break up the narrative and at the same time makes it possible to group correlated subjects conveniently in the appendix.

The chapters which follow the historical statement deal with the railways during the war years, the legislation which led to the Railway Act of 1921, the work of the amalgamation tribunal, government compensation for conditions growing out of governmental control, a description of the new system, and a short review of railroad amalgamation in other countries.

The interesting thing about the work of amalgamating the railways of Great Britain is that, despite the predictions of the pessimists, among whom were many railroad officials, the great majority of the companies when faced with the alternative of effecting a consolidation or having it done for them, got together and brought their schemes so near to completion that in most cases the hearing on the general plan for amalgamation lasted only a few days, and in one case it was completed in one day. Of course, minor details had to go to the Court of Appeals, but they had little effect on the progress of consolidation.

The parts of the Railway Act which deal more specifically with amalgamation are given in full in appendices, together with abstracts of other parts of the act, lists of amalgamation and absorption schemes, the text of some schemes, some of the financial details as to how the larger companies absorbed the smaller companies or how entirely new companies were formed to absorb all the amalgamated companies, details of the allocation of the railway compensation fund, and maps of the railway system.

Aids to Effective Talking on One's Feet

PUBLIC SPEAKING FOR BUSINESS MEN—By William G. Hoffman, Associate Professor of Public Speaking, Boston University, College of Business Administration. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x8 in.; pp. 300. $2.50.

Although the preface indicates that this book is designed for class use it seems well suited to self study by young or old who have had little or no instruction in public speaking or wish to "brush up" on the subject. It contains chapters on composing speeches, appearing before audiences, training the speaker's mind by reading, conversation and reflection; on improving the vocabulary, enunciation and pronunciation and the voice, and the more common types of address. It should prove stimulating and useful to the over-large number of engineers who even on informal occasions where only a five-minute talk is required, and a three-minute one might be better, state that "in order to be brief I have reduced my remarks to writing" and then read from manuscript for fifteen or twenty minutes.

Bibliography, Patents and Civilization

STATISTICAL BIBLIOGRAPHY IN RELATION TO THE GROWTH OF MODERN CIVILIZATION: Two Lectures Delivered in the University of Cambridge in May, 1922, by E. Wydham Hulme, B.A., Sandars Reader in Bibliography, Some Time Librarian of the Patent Office. London: Printed for the Author by Butler & Tanner, Grafton & Co. Boards, cloth back; 8 x 10 in.; pp. 50; 3 plates of diagrams. 6s.

The statistical basis of these lectures is a tabular survey of the divisions of literature in the 16th, 17th and 18th centuries, in which there is given the date and author of the first published monograph under architecture, building construction, ceramics, glass, ironwork, etc., and textiles; (2) a tabular survey of the number of author entries and the number of journals referred to in the International Catalogue of Scientific Literature, by years and by subjects from 1901 to 1913, together with related summaries; and (3) diagrams showing the number of British patents issued annually from 1800 to 1921 and by ten-year periods from 1561 to 1921, and the number of United States patents granted year by year from 1880 to 1921. The text is scholarly but for the most part rather heavy.

An Old Subject Freshly Presented

THE ELEMENTS OF PUBLIC HEALTH ADMINISTRATION—By George Sparr Luckett, A.B., M.D., Director of Public Health, State of New Mexico; Charter Fellow American Public Health Association; and Harold Farnsworth Gray, B.S., M.S., Gr.P.H., M. Am. Soc. C. E., Chief, Division of Sanitary Engineering and Sanitation, New Mexico Bureau of Public Health; Formerly Health Officer City of Palo Alto, California, State District Health Officer, California, Etc. Philadelphia: P. Blakiston's Son & Co. Cloth; 6x8 in.; pp. 460. $3.

The authors have presented the latest and best thought on public health work in a way well designed to meet the needs of the health officer in communities where little effective health work has been attempted, or at least accomplished, before. The result is so satisfactory, especially as regards arousing public interest and winning public support, that it promises to be useful to almost any health officer, no matter how experienced. The first part of the book deals with general administration and the second takes up the preventable diseases, one after another in accordance with a well planned topical scheme. A number of appendixes give forms for various records, reports, score cards and the like.

Trees in the Geologic Ages

TREE ANCESTORS: A GLIMPSE INTO THE PAST—By Edward Wilber Berry, Professor of Paleontology in Johns Hopkins University. Baltimore: Williams & Wilkins Co. Cloth; 6x9 in.; pp. 270; frontispiece and 48 line drawings. $3 in United States, Canada, Cuba, Mexico; $3.50 elsewhere.

The distribution of a considerable number of species of trees over the earth's surface during the geological ages is the subject of this unique book. The aim of the author is "to interest the general public in the marvelous history of some of our trees." A few pages are devoted to geological principles, how fossil plants have

been preserved and geological methods of time reckoning. Then about twenty trees or groups of trees are taken up in as many chapters, including birch, beech, oak, maple and persimmon. Fossil leaves and fruits are shown by means of line cuts. Maps are used to indicate the distribution of the trees over various parts of the earth's surface in the geologic ages.

PUBLICATIONS RECEIVED

DAILY RIVER STAGES, the U. S. Weather Bureau publication which reports observations at gage stations throughout the country, reaches its twentieth volume with the records presented for 1922. The publication was begun by the Signal Service, United States Army. Vol. I covered stations on the Ohio River and tributaries, 1858 to 1889; Vol. II was confined to the Mississippi and tributaries, excluding the Ohio, 1860-69; Vol. III dealt with miscellaneous stations in California, Oregon, North Carolina, etc., 1875-89. Volumes IV to XII covered all stations, but with from two to four years in a volume. All the volumes thus far mentioned are out of print. Beginning with 1915 a volume for each year has been issued. The 1922 volume includes 558 stations where river stages are read daily at least once a year, and 110 where readings are made "as circumstances may require." Besides the gage readings the many tables in the volume give considerable pertinent information regarding the river both at and above the stations.

OFFENSIVE ODORS believed to be due to oil refining and to burning oil as fuel in portions of Providence and in adjacent districts are the subject of a special report of the Rhode Island Board of Health (Providence). The larger part of the 64-p. pamphlet in hand is taken up with a detailed report by Stephen DeM. Gage, chemist and sanitary engineer of the board. Mr. Gage gives considerable weight to evidence which he presents indicating that the odors investigated have a material effect upon the health of the people in the odor troubled district.

THE MANY ENGINEERS who have occasion to use population figures will save time by getting and keeping at hand "Estimates of Population of the United States, by States and Cities, 1910 to 1923, and areas July 1, 1923," a pamphlet prepared under the supervision of Charles S. Sloane, geographer of the United States Census. County figures are given in this year's bulletin. (Washington, D. C., 15c. from Superintendent of Documents.)

MORE SETTLERS and how to get, finance and train them is the burden of the brief report on the Morrumbridge Irrigation Scheme recently made to the Government of New South Wales by Dr. Elwood Mead, the well-known irrigation engineer and land settlement specialist of Berkeley, Calif. The fact that this single project is burdened with an interest deficit of £1,773,284, or over $8,000,000, is a subject for the attention of critics of the U. S. Reclamation Service. Until more settlers can be obtained, Dr. Mead advises that the government assume part of the interest charges, particularly on the storage reservoir, weir and main canal which make up nearly half the deficit. Dr. Mead has also submitted to the same authorities a memorandum on River Murray Waters, the division and use of which concern not only New South Wales but also Victoria and South Australia. He advises the adoption by New South Wales of the doctrine of prior use as the ground for determining water rights and cites American practice in support of the proposal, as well as practice in many other countries.

TWO MORE VOLUMES of the Port series have been issued by the Board of Engineers for Rivers and Harbors, War Department, and the Bureau of Research of the United States Shipping Board: Volume 3 on the ports of Mobile, Ala., and Pensacola, Fla., and Volume 4 on the port of Philadelphia, Pa., including Camden, N. J., Chester, Pa., and Wilmington, Del. Very complete information concerning these ports is given, including port and harbor conditions, customs, port services and charges, fuel and supplies, harbor facilities, rail and water services, and information as to the territory served by the port. (Washington, D. C.; Superintendent of Documents; 75c. each.)

A NEW MONTHLY MAGAZINE, entitled "Dredging Engineering," with a sub-title "Embracing Port, River, Harbor and Waterway Improvement, Land Reclamation and Hydraulic Dam and Mining Operations," has been started by J. H. Leonard, 30 Church St., New York City. Mr. Leonard is both editor and publisher. The first number, December 1923, is devoted mainly to dredging work as conducted under the direction of the U. S. Engineer Department.

THE POPULARITY OF A GERMAN TEXT on architectural engineering designed for use by those who lack higher mathematics has led to a third printing. Included in the eight chapters are the following: mathematics of architectural engineering, tables and discussion of building material properties, rivets and bolts, joints, columns, roofs, unusual frames for factories, hangars, etc., and simple and complex structural-steel cross-sections with practical suggestions as to their construction. (Der Praktische Eisenhochbau, von Alfred Gregor. Berlin: Breest & Co.; $7 in Germany.)

New Books and Revised Editions

ADVERTISING CAMPAIGNS—By Harry Tipper, Business Manager of "Automotive Industries," and George French, General Editor of New Jersey Neighborhood Newspapers, Inc. New York: D. Van Nostrand Co. Cloth; 6 x 9 in.; pp. 423; halftones, charts and diagrams. $4.

A CENTURY OF LOCOMOTIVE BUILDING BY ROBERT STEPHENSON & CO., 1823-1923—By J. G. H. Warren. Newcastle Upon Tyne, England: Andrew Reid & Co. Cloth; 8 x 11 in.; pp. 461; freely illustrated with reproductions of paintings, engravings and line drawings. 28s.

CITY GROWTH AND VALUES—By Stanley L. McMichael, Realtor, and Robert F. Bingham, Attorney-at-Law. Cleveland, Ohio: The Stanley McMichael Publishing Organization. Cloth; 6 x 9 in.; pp. 369; diagrams and many halftones. $5.

THE ELEMENTS OF RAILROAD ENGINEERING—By William G. Raymond, C.E., LL.D., Eng.D., M. Am. Soc. C. E., M. Am. Ry. Eng. Assoc., Professor of Civil Engineering and Dean of the College of Applied Science, the State University of Iowa. Fourth Edition, Revised. New York: John Wiley & Sons. London: Chapman & Hall. Cloth; 6 x 9 in.; pp. 453; 113 figures in the text and 18 plates. $4. 20s. net.

In this edition "the chapter on Rails has been practically rewritten," and "an attempt has been made to clarify the discussion of rise and fall and the economics of ruling grade changes." The first edition was reviewed in *Engineering News* on April 16, 1908, by W. D. Taylor, and in third edition in *Engineering News-Record* on June 20, 1918, p. 1192, by M. P. Paret.

HANDBUCH DES DAMPFLOKOMOTIVEBAUES—Von. Dr. Martin Igel. Berlin: M. Krayn. Heavy Paper; 6 x 9 in.; pp. 606; illustrated. $3.75 in Germany.

HISTORY OF THE UNION PACIFIC: A Financial and Economic Survey—By Nelson Trottman of the Wisconsin Bar. New York: The Ronald Press Co. Cloth; 6 x 9 in.; pp. 412; 3 halftone plates and 7 maps. $5.

ORGANISATION UND BETRIEBSFÜHRUNG DER BETONTIEFBAUSTELLEN—Von Dr.-Ing. A. Agatz, Baurat in Bremen. Berlin: Julius Springer. Paper; 6 x 9 in.; pp. 88; 29 line cuts. 85c. in Germany.

PLAN READING AND QUANTITY SURVEYING.—By Chas. F. Dingman, M.Am.Soc.C.E., M.Am.Soc.M.E., etc. New York and London: McGraw-Hill Book Co., Inc. Fabrikoid; 4 x 7 in.; pp. 201; line cuts. $2.50.

Drawing on a personal experience with several construction organizations the author has prepared a handy and useful little book "to be used in scaling quantities from plans of projected buildings and in setting those quantities down in such form that they will be available for the use by the estimator." The book is limited to buildings.

THE PRINCIPLES AND PRACTICE OF SURVEYING: VOL. I. ELEMENTARY SURVEYING—By Charles B. Breed, Professor of Railway and Highway Engineering, Massachusetts Institute of Technology; and George L. Hoemer, Associate Professor of Geodesy, Massachusetts Institute of Technology. [Fifth (Revised) Edition.] New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Flexible; bible paper; 5 x 8 in.; pp. 592; 217 line cuts and halftones. $4.

For this edition a number of chapters have been entirely rewritten to include latest practice and exclude that which is more or less obsolete. The principles of city planning are emphasized, traverse determination by rectangular co-ordinates is given greater prominence, and survey balancing is treated in greater detail. The first edition was reviewed in *Engineering News*, Nov. 15, 1906, and the second volume of the main work was noticed in Oct. 15, 1908.

STATISTICAL ABSTRACT OF THE UNITED STATES, 1922—Washington, D. C.: Superintendent of Documents. Paper; 6 x 9 in.; pp. 755. 75c.

Contains the usual wide range of condensed summaries of the various statistical publications of the federal government.

Letters to the Editor

This department aims to be a forum for the discussion of the views of engineers and contractors. The range of interest should be as wide as possible. Contributors are, therefore, asked to make their letters short.

Definition of Research

Sir—In *Engineering News-Record* of Dec. 6, 1923, p. 915, an editorial suggests that some definition should be made of highway research to distinguish the routine work of testing materials from the more fundamental research studies. I have discussed the question from the standpoint of research in general in a report to the A.S.T.M., which has been reprinted in "Science," Sept. 14, 1923. The sections marked deal with the question of your editorial.

Lafayette, Ind., Dec. 13, 1923. W. K. HATT,
Head, School of Civil Engineering, Purdue University.

[Following is a list of the features of research as they are given by Prof. Hatt.—EDITOR.

1. Research work may be in industrial fields with a definite aim or in abstract science without thought of particular use.
2. The research may lie in the fields of any branch of knowledge that is treated in a scientific spirit, including, of course, the natural sciences, but not excluding mathematics, history, economics and medicine.
3. The method may be by deduction, based upon natural phenomena, and always referenced thereto, or by induction, using the methods of modern experimental science, both to discover new facts or uncover underlying laws.
4. The qualities by which true research are known are: earnestness, devotion, diligence and system, and in highest form, original and creative work.
5. Recognition should be given to skill and initiative in devising suitable methods and apparatus for use in observations, and care and devotion shown in difficult observations, skill in arranging and interpreting data, or forming generalizations upon them.
6. The result should be the discovery of something hitherto unknown.]

High Pressure Reservoir Outlets

Sir—Your generous review of the recent report on High Pressure Reservoir Outlets by Messrs. Gaylord and Savage, printed in *Engineering News-Record* of Dec. 20, p. 1026, has resulted in the receipt of many letters of inquiry.

The development of controlling equipment for the continuous discharge of large quantities of water under high heads, a task which had never been comprehensively undertaken prior to the advent of national reclamation work, has been extremely dramatic. Carefully planned and expensively constructed installations, conforming in every way to the best engineering practice at the time of construction, have been seriously crippled with almost unbelievable rapidity. Massive iron and steel castings, heavy steel plates, and thick walls of hard dense concrete, all with no vestige of projection or crevice to give the water a hold, have been torn out in a day or a week of operation. Heavy gates, installed under what was thought to be ideal conditions, have been shattered by vibration; while iron, steel and bronze have mysteriously melted away.

The disastrous results have been so unexpected and so out of line with previous experiences as to render it impossible to pass at a single stride to the correct solution of all the problems involved. In fact, the design of reservoir outlets is by no means fully developed today; but by the slow process of evolution many of the serious difficulties, which twenty years ago were not known to exist, have been overcome, and the underlying principles of high-head outlet works are now beginning to be understood.

In the present report the authors have attempted to record in as great detail as practicable the history of the various failures and successes which have led to the present practice of the Bureau of Reclamation in the design of works of this kind. It is an interesting story of pioneer engineering.

A very important part of the report is the second volume, which contains record drawings showing all of the important high-head outlets constructed by the Bureau of Reclamation to date. These drawings show the gates, hoists, machinery, conduits, and related features in detail, affording an invaluable fund of information on general designing practice.

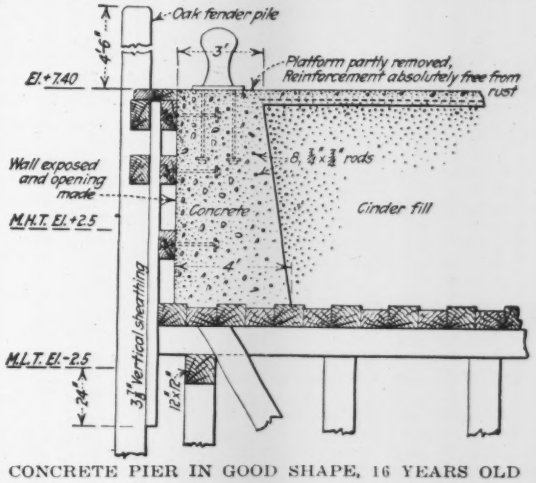
The report is intended primarily for the use of the engineers of the Bureau, although a limited number of copies are available for general distribution [$5 for the volume of text and $10 for the drawings; address U. S. Reclamation Office, Washington, D. C.—EDITOR].

Denver, Colo., Jan. 8. F. E. WEYMOUTH,
Chief Engineer, U. S. Reclamation Bureau.

Concrete Stands Up Sixteen Years in Tidal River

Sir—In connection with an extension of track at the D., L. & W. R.R. terminal on the North River in Hoboken, N. J., it became necessary to make an opening in the concrete pier-wall as well as to expose the side of the wall of what is known as the "immigrant pier," which is the first pier south of the ferry racks. This pier was built in 1906 in accordance with the accompanying section, the face protected by sheathing as shown, with fender piles every 9 ft., since boats would be tied up alongside.

These piles and sheathing have been removed and the exposed concrete found to be in perfect condition though subject to the action of tidal waters for sixteen years. At



CONCRETE PIER IN GOOD SHAPE, 16 YEARS OLD

low tide when the whole wall is exposed to view, an examination did not disclose even a semblance of a crack; or any other sign of deterioration. Difficulty is being experienced in breaking an opening through the wall due to the hardness of the concrete. The reinforcing bars and bolts show no signs of corrosion.

This is a corroboration of the statements made by Messrs. Wig and Ferguson in their series of articles on the behavior of concrete in sea-water in Vol. 79 of *Engineering News-Record*, that in their opinion all well-made portland cement concrete will withstand disintegration in sea-water if properly proportioned and carefully mixed and placed, provided that the surface or skin of the concrete is protected against abrasion by some mechanical means.

Hoboken, N. J., Dec. 28, 1923. M. HIRSCHTHAL,
Concrete Engineer, D., L. & W. R.R.

[It should be noted that the North River at Hoboken is not heavily saline, is heavily polluted with sewage and is never very rough. These conditions are important in considering sea-water exposure of concrete.—EDITOR.]

News of the Week

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Weeks Voices Opposition To Public Works Plan

Testifies War Department Should Retain Major Non-Military Engineering Activities

Washington Correspondence

Transfer of the major non-military engineering activities of the War Department to a proposed Department of Public Works was opposed by Secretary Weeks in testifying Jan. 11 before the Joint Committee on Reorganization of the Administrative Branch of the Government which began hearings Jan. 7 on the so-called Brown plan of reorganization which was submitted to Congress last spring by President Harding.

The attitude of Secretary Weeks before the committee came as a surprise as it had been understood that he was in favor of creating a Department of Public Works to include certain non-military activities of the War Department. At a hearing a few weeks ago regarding a proposal to create a government corporation to take over control and operation of the Mississippi-Warrior barge lines, now operated by the Inland and Coastwise Waterways Service of the War Department, Secretary Weeks stated that non-military duties are demanding too much attention from the War Department.

Secretary Weeks first appeared before the reorganization committee at its initial hearing Jan. 7, when he voiced opposition to that part of the Brown plan proposing consolidation of the War and Navy Departments into a Department of National Defense. A statement from Secretary Denby read at this session also opposed the consolidation.

Secretary Weeks' View

At his second and more lengthy appearance before the committee Jan. 11, Secretary Weeks said he believed that with a few exceptions the national interest would be best served by retaining in the War Department its present non-military engineering activities. He stressed in particular rivers and harbors works, declaring his opinion to be that such works can be carried forward more economically under army engineers than by any other plan of operation especially when it is considered that the experience thus gained is a valuable part of the training of the army engineers for war purposes. The Secretary said that the Board of Road Commissioners of Alaska might be transferred from the War Department to some other agency having control of other affairs in Alaska with some benefit. The Secretary opposed the proposed transfer of the Bureau of Insular Affairs to the State Department, on the ground that civil work in the Philippines is so closely allied with military matters that the two should be maintained under one head.

Under questioning by members of the joint committee, Secretary Weeks stated that prior to appearing before the committee Jan. 7 he had not discussed the proposed reorganization of the administrative departments with persons outside his own department more than a total of two hours. Between his appearance Jan. 7 and that of Jan. 11 he had discussed the subject twice as much as in all time previous to the first date, he said.

Secretary Weeks further asserted, in response to questions, that he did not consider that members of the cabinet were committed to the Brown plan or any other definite proposal. He ventured the opinion that most cabinet members had had no expert or technical advice upon which they could form an accurate judgment of the effect of transferring activities with which they are not familiar to their departments.

New President of American Society of Civil Engineers

C. E. Grunsky

Am. Soc. C. E. Officers Elected

In the canvass of ballots yesterday C. E. Grunsky, elected president of the American Society of Civil Engineers, received 2,603 votes out of 2,630 votes cast. Other officers and the votes cast for each follow: Vice-presidents (to serve two years), Zone 1, Lincoln Bush (2,507) and Zone 4, Oscar S. Bowen (2,502); directors: (to serve three years), District 1, Paul G. Brown (2,466) and Thaddeus Merriman (2,488); District 4, Robert Farnham (2,469); District 11, A. O. Ridgway (2,471); District 14, Alexander Maitland (2,468); District 15, J. M. Howe (2,469).

C. E. Grunsky Elected Head of Civil Engineers

Consulting Engineer of San Francisco of Wide Experience in Technical and Society Matters

C. E. Grunsky, head of the consulting engineering firm of that name of San Francisco, who was elected on January 16 president of the American Society of Civil Engineers at the annual meeting in New York City, was born April 4, 1865, in San Joaquin County, California. His early education was secured in Stockton High School from which institution he was graduated in 1870. His technical education for the most part was secured in Germany, being graduated from the Polytechnicum at Stuttgart in 1877. The same institution granted him a doctorate in engineering in 1910. Returning to his native state he was employed in the state engineering department of California from 1878 to 1888, successively as topographer, in charge of office computations, and chief assistant state engineer. While in the state engineer's office he was employed mainly on irrigation, river, hydraulic and flood control problems.

He first entered private practice in 1886 in Sacramento. Later he moved his offices to San Francisco continuing his practice there until 1899. Consulting work which he did included mainly irrigation engineering and supervision of sewerage and water supply design and installations.

Elected city engineer of San Francisco in 1900 Mr. Grunsky served for four years. At the expiration of his term he was made a member of the Isthmian Canal Commission, serving for a year. From 1905 to 1907 he was consulting engineer for the U. S. Reclamation Service and advisor to the Secretary of the Interior. From 1908 to the present time he has been in private practice both in New York and San Francisco. From 1910 he has been practicing almost exclusively on the Pacific Coast, the firm first being known as the American Engineering Corp., but since 1914 as the C. E. Grunsky Co.

Besides having been for a number of years active in professional society affairs, Mr. Grunsky has been a frequent contributor to the technical press and is as well as the author of several books, including "Topographic Stadia Surveying," "Valuation, Depreciation and Rate Base" and "Public Utility Rate Fixing."

Steel Constructors to Meet

The annual meeting of the American Institute of Steel Construction will be held at the William Penn Hotel, Pittsburgh, Jan. 23 and 24. Part of the program is devoted to a broad campaign to further protect the interests of structural steel and to extend the adoption of the Institute's standard specifications for building construction.

Official programs and further details may be obtained by addressing Charles F. Abbott, 350 Madison Ave., New York.

F.A.E.S. Changes Name to Engineering Council

Other Constitutional Revisions at Annual Meeting—James Hartness Elected President

Engineering News-Record Staff Report

At the annual meeting of the Council of the Federated American Engineering Societies at Washington, Jan. 10 and 11, a new constitution was adopted by virtue of which the name American Engineering Council will supplant that of Federated American Engineering Societies. What has hitherto been known as the Council becomes under the new constitution the Assembly, and the Executive Board in the future is to be known as the Administrative Board. The membership requirements remain about as before; that is, the representation on the general assembly of member societies shall be on the basis of one representative for each society having a membership of from 100 to 1,000 with one additional representative for each additional 1,000 members or major fraction thereof.

The Administrative Board is to consist of not to exceed 30 members, of whom 6 shall be elective officers of the Council and the remainder representing the member societies with a provision that the national society representation to the local societies shall bear the same ratio as the similar societies do in the general assembly. Provision is made that no decision affecting the policy or action of the Council shall be made by either the general assemby or the Administrative Board unless it shall receive a two-thirds affirmative vote of (a) the national society representatives having six or more representatives on the assembly, (b) the aggregate of the representatives present for the other national member societies, and (c) of the aggregate of the representatives present of the minor societies. Furthermore it is specified that a representative on the general assembly or the Administrative Board is to have technical qualifications about those of an associate member of the American Society of Civil Engineers.

HARTNESS ELECTED PRESIDENT

Following the resignation of Dean M. E. Cooley as president of the Federation, to take effect this January, the Council elected as its president James Hartness, former president of the American Society of Mechanical Engineers and former Governor of Vermont. Mr. Hartness took office at this meeting to serve two years.

The discussions at the Council meeting related mainly to organization matters. The budget for the coming year is fixed at $40,756. This amount is expected to be derived from $15,483 from the American Institute of Electrical Engineers, $17,430 from the American Society of Mechanical Engineers, and the remainder from the 25 societies having only one representative each. The American Institute of Mining and Metallurgical Engineers and the Society of Industrial Engineers have resigned from the Federation. It was decided to publish the bulletin of the Federation quarterly instead of monthly, but a proposal for more extensive publication activities is under serious consideration by the assembly.

Am. Soc. C. E. Awards Collingwood Prize to Jacob Feld

Jacob Feld, of Brooklyn, N. Y., yesterday was awarded the A. Soc. C. E. Collingwood Prize for Juniors for Paper No. 1529 on "Lateral Earth Pressure: The Accurate Experimental Determination of the Lateral Earth Pressure, Together with a Résumé of Previous Experiments," a prize consisting of $50 in cash and a certificate signed by the president and secretary of the society.

Mr. Feld, born in Poland in 1899, received a bachelor of science degree from the College of the City of New York in 1918, M. A. and C. E. degrees from the same institution three years later, and a Ph. D. from the University of Cincinnati in 1922. For two years he was research fellow and assistant instructor at the University of Cincinnati, in 1922 being appointed instructor in mathematics and engineering at the Ohio Mechanics Institute in Cincinnati. He then went with Turner Construction Co. as a detailer and designer, and entered the employ of D. B. Steinman in May, 1923.

The Council adopted the resolution approved early in the week at the Public Works Conference approving a reorganization of the federal departments and accepted the responsibility of carrying out the instructions of that conference. A further engineering investigation should be made of the Great Lakes-St. Lawrence waterway before a final decision is made in regard to that project, one of the resolutions adopted by the Council provided. The Council decided to retain representation on the national board of jurisdictional awards. Full co-operation was pledged the War Department in response to the personal invitation of the assistant secretary of that department in carrying out the plan for industrial preparedness. The Council formally gave assurances to the Italian Ambassador that it would assist in placing the 150 Italian graduate engineers who are coming to this country to supplement their college course with a period of practical work in American industry.

A delightful dinner was given by the Council at the Chevy Chase Club the evening of Jan. 10, at which Secretary of Commerce Hoover, President Nicholas Murray Butler, of Columbia University, and Assistant Secretary of War Dwight Davis gave formal addresses.

Sixth Queenston Unit in Service

The Sixth Unit of the Queenston-Chippawa plant of the Ontario Hydro-Electric Power Commission, a 55,000-hp. unit, was put into operation Jan. 8. This brings the capacity of this one plant up to 350,000 hp. Units 7 and 8 are now being installed and the chairman of the commission will ask the provincial government for approval of the installation of units 9 and 10. This will bring the total capacity of the Power Commission's system up to 965,000 hp. by 1926.

Am. Soc. C. E. Opens Annual Meeting in New York

Authorization of the formation of a committee on cement of the society, backing by resolution of the tax reduction program of Secretary of the Treasury Mellon, and adoption of resolutions concerning the death of George G. Anderson, former vice-president of the society, were principal features of the meeting on Jan. 14 and 15 of the Board of Direction of the American Society of Civil Engineers. The meeting of the board preceded the annual meeting of the society which opened yesterday morning in the Engineering Societies Building, 29 West 39th St., New York City. Formation of a committee on cement will probably soon be undertaken by C. E. Grunsky, the new president of the society. In authorizing the formation of the committee on cement the specification was made that the committee should contain members other than members of the Am. Soc. C. E.

The convention in its first open meeting yesterday, Jan. 16, adopted the resolution which the board had prepared endorsing Secretary Mellon's tax revision program, especially as it concerns lowering the tax on incomes. The resolution called for notification of President Coolidge, Secretary Mellon, all national engineering societies and local sections of the American Society of Civil Engineers, of that society's action in urging upon Congress adoption of Secretary Mellon's program

Ceremonies incident to the opening of the annual meeting and the award of the society's medals and prizes, winners of which are noted on another page in these columns, occupied most of the opening session of the annual meeting.

Imhoff Tank Patents Included in Chemical Foundation Case

American patents on the Imhoff sewage tank were included in the German patents at issue in the suit decided on Jan. 3 by a lower court in favor of the Chemical Foundation. Under the decision, unless reversed on appeal, the Imhoff tank patents remain vested in the Chemical Foundation and licenses for the use of the patent will continue, as heretofore, to be issued by it, through the Pacific Flush-Tank Co. of Chicago and New York.

The company represented Dr. Karl Imhoff in the United States and Canada from May, 1911, until the United States entered the war, whereupon it began reporting to the United States Government. On Dec. 17, 1917, the Pacific Flush-Tank Co. was authorized by the Federal Trade Commission to issue licenses on behalf of the federal government, the money collected, less expenses, to be turned over to the alien property custodian. On March 1, 1919, the patents were seized by the alien property custodian and on March 21, following, they were sold by him, with all claims thereunder, to the Chemical Foundation, Inc. Subsequently this organization entered into a contract with Pacific Flush-Tank Co. to act as its exclusive agent in issuing licenses on collecting fees under the American patents on the Imhoff tank, the fees to be the same as had been charged by the company before the war.

Winners of American Society of Civil Engineers Medals and Prizes

The Norman Medal, award of which for this year is made to D. B. Steinman, consulting engineer, New York, for Paper No. 1520, "Locomotive Loadings for Railway Bridges," was instituted and endowed in 1872 by the late George H. Norman, a member of the society. Competition for the prize, which is a gold medal, is open only to members of the society and its award is made upon the basis of published original contributions to engineering science.

Mr. Steinman was graduated from Columbia University in 1909 with the degree of C. E., receiving his doctor's degree in 1911. After having received a B. S. degree in 1906 he was appointed instructor in surveying at the College of the City of New York, where he remained for four years, at the same time doing independent engineering work. From June 1910 to June 1914 Mr. Steinman was successively instructor, assistant professor, associate professor and professor of civil engineering at the University of Idaho.

Entering consulting work in 1917 as a special assistant to Gustav Lindenthal, he was in charge of the field and office force on the design and construction of the Sciotoville bridge across the Ohio River and made studies of and reports upon other bridges and viaducts, among them being the Philadelphia-Camden bridge, the Chelsea South bridge, Boston; the Passaic River bridge for the Erie R.R.; and the Newark Bay structure for the Pennsylvania and the Lehigh Valley railroads. From Septem ber 1917 for three years Mr. Steinman was professor in charge of civil and mechanical engineering at the College of the City of New York. Since June of the latter year he has been in consulting practice except for a few months when he served as assistant engineer with the New York Central R.R.

* * *

The J. James R. Croes medal was presented to James F. Sanborn, consulting engineer, New York, for Paper No. 1509 on "Engineering Geology of the Catskill Water Supply," prepared by Mr. Sanborn with Dr. C. P. Berkey, of Columbia University as co-author. Inasmuch as Dr. Berkey is not a member of the society the medal, established by the society in 1912 and named in honor of the first recipient of the Norman medal, goes to Mr. Sanborn. Its award is made to that paper published in "Transactions" considered next in order of merit to the Norman medal.

Mr. Sanborn is a graduate of the Lawrence Scientific School of Harvard University, receiving a degree of B. S. in mining and metallurgy in 1899. For three years after his graduation he did general engineering work, becoming an assistant engineer with the N. Y. Rapid Transit Commission in 1902 in subway design and construction. In 1905 he became associated with the N. Y. Board of Water Supply, serving until 1909 as assistant engineer and then as division engineer on the Catskill aqueduct work. In 1919 he entered consulting practice.

* * *

The Thomas Fitch Rowland prize, originally instituted by the society at its annual meeting of 1882, and awarded yesterday to F. W. Peek, Jr., consulting engineer to the General Electric Co., Pittsfield, Mass., was endowed by the late Thomas Fitch Rowland, honorary member of the society, in 1884. This prize, award of which is not restricted to members of the society consists of $60 in cash, with an engraved certificate signed by the president and the secretary. The first award was made to Gustav Lindenthal in 1883. The paper which won the Thomas Fitch Rowland prize for Mr. Peek was Paper No. 1521 on "High Voltage Power Transmission."

Mr. Peek is a native of California and a graduate of Stanford University of the year 1905; he received his master's degree from Union College in 1911. He became connected with the General Electric Co. in 1905, spending two years in the power and mining department. In 1909, upon its formation, he joined the staff of the consulting engineering department.

* * *

Roy W. Gausmann, division engineer, and Charles M. Madden, assistant engineer, N. Y. Board of Water Supply, were awarded the James Laurie prize for Paper No. 1514 on "Experiment with Models of the Gilboa Dam and Spillway." The James Laurie prize was established by the society Oct. 1, 1912, and is named in honor of its first president. It consists of $40 cash with an engraved certificate.

Practically all of Mr. Gausmann's professional experience has been gained in the service of the New York Board of Water Supply. He was a student at the school of civil engineering of Columbia University from 1901 to 1903. He became associated with the Board in 1903, being raised through various professional grades until he became an assistant engineer in 1906, being successively in charge of drafting for 1,000 properties in the Ashokan reservoir surveys, in charge of field work and inspection of dams, bridges and highways for the board and in the construction of various engineering work. In 1917 he entered the military establishment, serving overseas in Flanders and in the major American engagements.

Since 1919 Mr. Gausmann has been with the Board of Water Supply, for three years as assistant engineer and since 1921 as division engineer.

Mr. Madden, too, has long been with the N. Y. Board of Water Supply, becoming associated with it first in 1907 and being raised through various grades until in 1912 he became chief assistant inspector on the construction of a section of the Catskill aqueduct. He then became identified with the construction of the Storm King Highway, first as an inspector with the N. Y. Highway Commission then with J. L. Hayes, the contractor, in chage of all engineering work. He rejoined the Board of Water Supply in 1916 as inspector in charge of borings for the Shandaken tunnel. From 1917 to 1919 he served in the military establishment, acting as printing officer for the Intelligence Section of the A.E.F., being attached to the 29th Engineers. From February, 1919 he has been an assistant engineer in the Board of Water Supply.

* * *

The award to J. P. Newell, consulting engineer of Portland, Oregon, of the Arthur M. Wellington prize, is the first presentation of this prize, instituted and endowed in 1921 by *Engineering News-Record*. Its award is not restricted to members of the society. It consists of $75 in cash with an engraved certificate signed by the president and secretary of the society. It is awarded for papers on transportation and was given to Mr. Newell for Paper No. 1516; "Analysis of Cost of Freight Service, Grand Trunk Railway Co. of Canada."

Mr. Newell, who was born in Portland, Oregon, where he has maintained consulting offices for a number of years, secured his technical education at Massachusetts Institute of Technology. From that institution he went to the Cincinnati Southern Ry. as draftsman in 1888, leaving the next year for the West where he entered the employ of the Oregon Railway & Navigation Co. as assistant engineer and later as division engineer of the Elgin branch. Leaving that road for a few years he returned in 1894 as assistant engineer in the construction department and was placed in charge of the location and construction of the Sierra Nevada branch. His next work with the O. R. & N. (now the O.-W. R. & N. Co.) was line revision.

From June 1904 to June 1907 he was division engineer, maintenance-of-way, of the Oregon Division of the road, being placed in charge of 600 miles of track. Since that date he has been in consulting practice in Portland.

He has been a frequent contributor to the technical press and gained international prominence as a member of the Dominion Government's consulting staff in the valuation of the Grand Trunk properties.

Renew Agitation for Public Works Department

Representatives of Engineering Societies Hold Conference at Washington

Engineering News-Record Staff Report

At the call of the Federated American Engineering Societies some 80 engineers, representing 60 separate engineering and allied organizations, met at Washington on Jan. 9 in a "Public Works Conference" to consider the forwarding of the movement for a federal department of public works. The meeting was presided over by P. N. Moore, of St. Louis, and was addressed by Secretary Hoover, Mr. Willoughby, of the Institute of Economic Research, and Mr. Graves, of the United States Bureau of Efficiency.

Secretary Hoover said the principal advantage of a department of public works is that it would create a center of government construction policy, and while the saving in personnel and efficiency would be increased by co-ordinating all engineering work under the government, he thought the value would lie more in leadership for the great balance wheel of construction which lay in government construction work. He said the Cabinet was not united on the Brown plan for departmental reorganization. Mr. Willoughby, who has made an exhaustive study of the governmental departments, told why the reorganization was necessary and stated that the engineers must remember that to get the thing through they must prove it is an advantage to the whole government and not only to the engineering profession. He argued for a department of public works and public domain, because these two fields overlap so frequently. Mr. Graves said that in the present War Department non-military activities there were 25,000 civilians and about 500 army engineers. Under the new plan a department of public works would include 50,000 civilians, 4,500 at Washington, and including too the 25,000 civilians in the present War Department non-military activities.

Resolution Adopted

After some discussion as to procedure, the following resolution was adopted as the sense of the meeting:

"WHEREAS the present structure of the federal departments represents the unpruned growth of many years and is imperfectly adapted to present needs; and

"WHEREAS definite recommendations have been made by both President Harding and President Coolidge emphasizing the need of a reorganization of public business, and a plan of general reorganization of departments is under consideration by a joint committee of Congress; and

"WHEREAS the engineers and architects, and related technical professions of the country have for many years advocated the establishment of a National Department of Public Works in which the matters relating to public works might be administered and co-ordinated; and

"WHEREAS the consideration of recent bills for the creation of a Department of Public Works was suspended in the interest of a general reorganization; and

"WHEREAS this subject has received the careful consideration of this conference representing more than sixty engineering, architectural and related organizations of the country; and

"WHEREAS the establishment of a Department of Public Works would make it possible to place governmental engineering and architecture on planes reflecting the highest achievements in these professions, known to the world; and

"WHEREAS, a co-ordinated functioning of all public works agencies would be able to stabilize business and employment by expanding public work when private industry and employment may be slack, and by reducing such work as far as practicable when private industry may be fully absorbing the available supply of men and materials; and

"WHEREAS, the advance and co-ordinated planning of public works is sound economy in that it permits the government to execute less work at peak prices and more work at the lower prices prevailing during dull times; Be it therefore

"RESOLVED: That this conference of engineers and architects, and allied interests, heartily approves the movement for a reorganization of Federal Departments, and it particularly endorses grouping and co-ordinating within an existing Department, preferably renamed a Department of Public Works, the construction and administration of all non-military public works."

A committee was appointed to call on the joint committee of Congress which is now considering the public works matter. There was considerable debate on the proper method of organization for the future advocacy of a department and it was finally voted as the sense of the meeting that the work should be carried on by the American Engineering Council and that each interested society, particularly those represented, should be asked to appoint a member to an advisory committee to co-operate with the Council in carrying out the program of the department.

The general impression gained from hearing the speakers at the meeting was that there is a possibility of the department of public works going through, but that the situation in regard to entire departmental reorganization is complicated by the various jealousies and prides in the different departments to such a degree that it is extremely doubtful if any agreement can be reached in Congress as to the bill embodying a possible reorganization. A committee is now in session composed of representatives of the Senate and the House and one representative of the President, which is holding hearings on the proposed department. Nothing will be done in Congress until or unless a bill emerges from these hearings.

Denver A.G.C. Elects Officers

At its annual meeting Dec. 28, the Denver unit of the Associated General Contractors of America elected C. S. Lamble, president; J. Fred Roberts vice-president; and Frank J. Kirchhoff, secretary-treasurer, to serve during the year 1924. Directors for two years are: Alex Simpson, Jr., J. Everett Young and Maurice Levy; for one-year term: Frank L. Hoffman, George M. Tamblyn, John T. Gibson, and C. M. Kendall.

New Offer Made for Muscle Shoals Power

Association of Nine Companies Would Lease Property for Fifty Years for $100,000,000

An association of nine companies who furnish the majority of power in the States of Tennessee, Alabama, Georgia, North and South Carolina, have presented to the federal government an offer to lease the Muscle Shoals property for fifty years at an average annual rental of about $2,000,000. To carry out the plan one or more of the nine companies would be prepared to submit a proposal contemplating the organization of a company to lease the plant, assuming all the obligations of the Federal Water Power Act; relieving the government of the expense of providing additional power units in excess of eight; and supplying necessary power to operate the government locks without expense to the government.

The offer also proposes that the license provide operation by the federal government of the project for the manufacture of nitrates, explosives or munitions of war, or for any other purpose involving the safety of the United States, for such a length of time as would appear necessary for the purposes; and that the project covered by the license would be subject to recapture by the government any time during the license period, or at the end of fifty years, under the terms of the Federal Water Power Act. In the event the government should desire to sell the entire hydro-electric power plant at a fixed sum, one or more of the companies would be prepared to submit such a plan of purchase, the works so purchased to be operated under the Federal Water Power Act. Under the proposed operation of the project, ample provision is made for the supply of electric energy for the manufacture of fertilizer at Muscle Shoals.

Terms of Rental

The associated companies agree to pay a rental to the government sufficient to meet all interest charges on expenditures on the project to the time of its completion, including the $17,000,000 expended during and just after the war. This total expenditure is estimated at around $45,000,000 on the assumption that the government install eight generating units and a hydro plant, to which should be added $4,500,000, the present value of the government's steam plant at Muscle Shoals, making a total of about $50,000,000 as the basis for interest charges. This interest return, therefore, taken at the government rate of 4 per cent, amounts to about $2,000,000 per annum, which the licensee would be prepared to pay.

The offer contains the information that the entire Muscle Shoals power could be absorbed in the South within a period of not exceeding ten years from the completion of the project.

The companies making the joint proposal are as follows: Columbus Electric & Power Co., Carolina Power & Light Co., Yadkin River Power Co., Asheville Power & Light Co., The North Carolina Electrical Power Co., The Tennessee Electric Power Co., Memphis Power & Light Co., Alabama Power Co., and the Central Georgia Power Co.

Would Make Few Changes in Transportation Act

Voluntary Grouping of Railroads—Tax on Gross-Net Income—Commission to Control Motor Transport

Engineering News-Record Staff Report

Secretary Hoover voiced the general opinion of the members of the National Transportation Conference, held in Washington, D. C., Jan. 9 and 10, 1924, when he said that his personal views in regard to national policies on transportation questions—stripped of secondary considerations—would be as follows:

1. Railway service under private ownership in order to secure the driving force of individual initiative in efficiency and development.

2. Government regulation of fair rates and railway finance in order to protect the shipper and to give stability to honest investment of savings.

3. Recapture of excess profits in order to allow rates which will assure operation and service from railways in less favored circumstances yet prevent unjustified profits from any particular railways.

4. The earliest practicable consolidation of the railways into larger systems under conditions of maintained competition in service in order to secure greater economy in operation, assurance of development and lower rates, and greater stability in earnings.

5. A basis of employer and employee relationship that will stimulate mutual responsibility as the first requisite to continuous service.

6. Reorganization of the rate structure in order to secure a better adjustment of the burden between commodity, class, and less-than-car-load rates, most of which can best be accomplished after consolidation and consequent wider diversification of traffic.

7. Co-operation between the shipper and the railways in order to secure a better distribution of traffic over the year and to avoid congestion of peak periods of car shortages.

8. Definite development of relief in freight terminals, including co-ordination with motor truck feeders and distribution.

TERMINALS, RATES AND WATERWAYS

9. Development of proper joint rates and service by water and rail transportation in order to relieve extension of railways where unnecessary and give the public the advantage of cheaper water transport.

10. A comprehensive national plan of inland waterway development in substitution of hit or miss activities, with priority in development to rivers and canals where substantial traffic may be expected, including development of the St. Lawrence waterway, etc.

The conference was called by the Chamber of Commerce of the United States to consider the report of five committees which had been studying the various phases of transportation, which reports had been submitted to the members of the conference in November. These members represented all parties in the country particularly interested in transportation, including the railroads, motor transport companies, shippers, manufacturers, farmers, public utility commissioners, and state and federal officials.

After listening to addresses by Secretary Hoover, Walter D. Hines, and President Barnes of the Chamber of Commerce, the conference took up the recommendations of the five committees and the joint committee (abstracted in *Engineering News-Record*, Dec. 13, 1923, p. 974) and discussed them point by point. At the close of the discussion a committee formulated a set of declarations to include the results of the discussion and these declarations were later revised and finally passed upon in open conference. In a general way, they follow Mr. Hoover's expression of his opinion and the recommendations of the five committees, but they fail to fulfil Mr. Hoover's wish for some definite plan to improve upon the Railway Labor Board. Mr. Doak said that the railroad labor organizations had such a plan worked out, but that he was not in a position to give it out at this time.

OUTSTANDING DECLARATIONS

The outstanding declarations of the Transportation Conference are:

There should be no change in important provisions of the Transportation Act;

Private ownership of the railroads should continue under regulation by federal and state administrative agencies and not by legislative action on specific cases, such as rates and fares;

Continuation of the rate-making rule of the Transportation Act along with the provisions for recapture of excess earnings, the limit of 5½ per cent to be increased if experience shows that it is inadequate to allow railroads to compete with other concerns in raising capital;

Railroad dividends should be high enough to make it possible for them to sell stock rather than bonds when in need of new capital;

The Interstate Commerce Commission should be given every facility to complete the valuation of the railroads in order to give a definite basis for consolidation and rate revision;

The Interstate Commerce Commission should have complete control of interstate rates and should co-operate with state commissions in the control of intrastate rates;

No general reduction of rates is recommended, but rather a readjustment of relative rates. This should be carried on as far as possible through co-operative study by the railroads, shippers, and representatives of the Interstate Commerce Commission;

The Interstate Commerce Commission's plan of consolidation should be completed as soon as possible and if necessary the consolidation provisions of the Transportation Act should be amended to permit voluntary consolidation when approved by the Interstate Commerce Commission; and

Provision for the joint use of terminals, especially in congested centers, should be made as rapidly as possible.

Motor Transportation—Rail and motor transport should co-operate for the relief of terminal congestion by store-door delivery and by a systematic handling of freight by organized motor transport companies. All motor transport companies should be treated as common carriers and controlled by the Interstate Commerce Commission as to rates and financing. Railroads should be allowed to supplement their service by motor transport and to discontinue unprofitable rail service where motor transport is available.

Taxation of Transportation Agency—The present method of taxing steam and electric railroads should be abandoned and taxes should be based on gross earnings, together with a graduated tax on net earnings. The same rule should be applied to motor transportation when organized.

Development of Waterways—A national survey of the present and possible future waterways should be made by the Corps of Engineers in consultation with the Department of Commerce to determine the engineering, commercial, and economic possibilities of each, and to prepare a schedule of priorities. Through rail and water rates should be established wherever economically possible. The Secretary of War should be empowered and given funds to operate the Mississippi and Warrior River barge lines.

Legality of Trade Statistics Still Uncertain

That confusion exists in the official mind regarding the exact interpretation of the Sherman Act as it relates to the collection and distribution of trade statistics is indicated by recent correspondence between Herbert Hoover, Secretary of Commerce, and H. M. Daugherty, the Attorney-General. Following the consent decree entered in the district court of the United States in the case of the United States vs. the tile manufacturers, Secretary Hoover addressed a letter to the Attorney-General in which he tried to get a definite opinion as to the legality of the collection of production statistics by the Department of Commerce and specifically whether the department had better discontinue its plan of co-operation with trade associations whereby those associations collected statistics and transmitted them to the department for publication and distribution.

In his reply the Attorney-General devotes most of the space to reference to prior letters on the subject, none of which particularly clarifies the present situation. He makes it clear that in the opinion of the Department of Justice information as to conditions in the industry, such as total production, shipments, stocks on hand, average price, range of prices, when made available for the whole industry to the whole industry destroy free competition which without this information would prevail. He says that it is not a fact that publicity through the press or some government agency removes illegality from such procedure, but he further states that the illegality arises "from the co-operation among the members pursuant to a positive or tacit understanding" and intimates that such positive or tacit understanding is an essence of any such distribution of statistics.

In the last paragraph he qualifies the situation by saying: "I have no doubt that it is important that those engaged in an industry have general information as to the conditions of that industry, but I think that information should be distributed strictly through a responsible medium like your department, and I see no objection to its being gathered by an association provided it be strictly guarded and the association be prohibited from distributing it among its membership."

Engineering Societies

Calendar

Annual Meetings

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington, D. C.; Annual Meeting, Chicago, Ill., Jan. 21-24, 1924.

ENGINEERING INSTITUTE OF CANADA, Montreal; Annual Meeting, Montreal, Jan. 22, and Ottawa, Jan. 23, 24, 1924.

AMERICAN CONCRETE INSTITUTE, Detroit, Mich.; Annual Meeting (20th anniversary), Chicago, Ill., Feb. 25-28, 1924.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, Chicago, Ill.; Annual Meeting, Chicago, March 11-13, 1924.

AMERICAN WATER WORKS ASSOCIATION, New York City; Annual Convention, New York City, May 19-21, 1924.

The Western Society of Engineers will be addressed Jan. 21 by C. E. Grunsky, president, American Society of Civil Engineers, on "The Engineer in Public Life." On Jan. 28 a symposium of short papers on "Types of Movable Bridges in Chicago" will embrace descriptions of the Scherzer, Waddell lift, City of Chicago, American Bridge Co., and Rall types. On Jan. 24 William Artingstall, consulting engineer, will tell the Young Men's Forum how the La Salle St. tunnel was built on a raft, floated to position and sunk. Andrews Allen, consulting engineer, Jan. 10, discussed contracts and specifications with the young men.

The San Francisco Engineers' Club on Dec. 27 was addressed at a noonday luncheon by Edgar S. Nethercut of Chicago, secretary of the Western Society of Engineers. His subject was, "The Engineer and the Public."

The Engineering Society of Western Massachusetts will hold its January 21 meeting in conjunction with the Springfield Section of the American Institute of Electrical Engineers. The speaker will be A. C. Eaton of Worcester, Mass., who is hydraulic engineer of the construction department of the New England Power Co. who will give an illustrated talk about the Davis Bridge Dam, now under construction in southern Vermont.

Personal Notes

HARRY N. JENKS, sanitary engineer, has been made superintendent in charge of operation of the filtration plant recently completed at Sacramento, Calif. Mr. Jenks, who is a graduate of the University of California, was for a time engaged in public health work in British India, was later employed by the Chicago sanitary board in connection with sewage disposal problems, and subsequently was affiliated with the California State Board of Health. He has been connected in an engineering capacity with the Sacramento filtration plant from the beginning of the work.

NORMAN F. BROWN, consulting engineer, Pittsburgh, Pa., has been appointed for a four-year term to the newly created position of director of public works for Allegheny County, Pennsylvania, with headquarters in Pittsburgh. Mr. Brown will have charge of all county construction and maintenance of highways, bridges, tunnels, subways and underground roads and immediate direction of the organization and work of the bureaus of county engineering and county roads. Roy D. Schooley, county road commissioner, and Vernon R. Covell, county engineer, will continue in their present work under the new director. A large number of improvements will be undertaken in the near future, including the Liberty Tunnel bridge, the Glassport bridge, and the raising of bridges over the Allegheny River. Mr. Brown was formerly in charge of construction for the Pennsylvania R.R. in the Pittsburgh district and after the war was director of public works in Pittsburgh and later vice-president of the Dravo Contracting Co.

LEWIS R. OWEN, of Owen & Plummer, engineers, Johnstown, Pa., has been appointed county engineer for Cambria County, Pennsylvania, for a four-year period, succeeding H. Frank Dorr, of Ebensburg. Mr. Owen is a graduate of the University of Nebraska. He worked for some time in the West and then with the Cambria Steel Co. and C. P. Collins & Co. in Cambria County, and was later borough engineer for Ferndale, South Fork and Brownstown. The firm of Owen & Plummer is dissolved, Mr. Plummer continuing the business alone.

D. WALTER DILLMAN, engineer, Altoona, Pa., was recently re-elected as engineer for the borough of Cresson for the fourteenth time. He was also elected as borough engineer for Juniata for the second year.

CHARLES F. CROWLEY, commissioner of public works at Troy, N. Y., during a former mayoralty administration, has just been again appointed commissioner of public works at Troy. JOHN C. WATTS, formerly engineer of the Harbor and Dock Commission at Troy, has been appointed city engineer, succeeding ALFRED E. ROCHE, who for twelve years had been chief engineer of public works and the water bureau. Mr. Watts was formerly deputy engineer under Mr. Roche. JOHN FLYNN, JR., formerly city engineer, will be in charge of dock construction under the direction of the Harbor and Dock Commission.

ERLER CORPORATION, Tampa, Fla., has recently been organized with the following incorporators: L. J. ERLER, president, formerly a captain in the United States Army and a graduate of West Point; W. C. ERLER, secretary, for the past nine years contracting manager of the M J. Hoffman Construction Co., Evansville, Ind.; and W. J. ERLER, vice-president, of Terre Haute, Ind. The new firm will engage in paving, sewerage and earth work. The office address is 906 Citizens Bank Bldg., Tampa, Fla.

C. A. P. TURNER CO., engineers, have moved their offices in Minneapolis from 627 First Ave., N., to 300 Builders Exchange Bldg.

MCCLELLAN & JUNKERSFELD, consulting engineers, will move their offices on Feb. 1 from their present location at 45 William St., New York City, to 68 Trinity Pl., New York City.

HERMANN FOUGNER has been elected vice-president and director of Thompson & Binger, Inc., engineers and contractors, 103 Park Ave., New York City. G. W. Thompson resigned about a year ago, due to illness, and Mr. Fougner comes in as Mr. Binger's partner. While the bulk of the work of the firm is reinforced-concrete construction, it is at the present time building, for the Mergenthaler Linotype Co., a lot of workmen's two-family brick houses, the first portion consisting of thirty-four houses in the Flatbush section of Brooklyn. Mr. Fougner was formerly president of the Fougner Concrete Steel Co., and vice-president of the Thompson-Starrett Co., both of New York City, and had previously served Milliken Bros., New York City, as Far East representative.

W. E. RODGERS, civil engineer, 421 West Market St., Louisville, Ky., announces entry into partnership with H. E. READ, civil engineer, under the firm name of RODGERS and READ, engineers and surveyors, and the new firm is in the Realty Bldg., Louisville.

J. A. NEALE, who has been chief engineer of the Tennessee Inspection Bureau of several years, has resigned and accepted a position with the Chicago Board of Underwriters, and will be located at the Insurance Exchange Bldg., Chicago, Ill.

A. C. LINGLEY, former construction engineer for the Missouri State Highway Department, resigned recently and will enter the contracting business in St. Louis. A farewell banquet was tendered him by the department on Dec. 31. WILLIAM SPANN, formerly division engineer for the Missouri State Highway Department at Kansas City, succeeds Mr. Lingley as construction engineer for the department.

VERNE LEROY HAVENS, until recently editor of *Ingenieria Internacional* of the McGraw-Hill Co., and now engaged in private practice, in New York City, has been awarded a gold medal and diploma by the Brazilian Government in recognition of his successful efforts in organizing the International Engineering Congress which took place in Rio de Janeiro last year. Besides his task as the active organizer of the congress he was delegated to represent the American Society of Civil Engineers and the Engineering Institute of Canada, of which societies he is a member, and also the Federated American Engineering Societies and the American Electric Railway Engineering Association. While in Rio de Janeiro he was also made an honorary member of the Club de Engenharia de Brasil, the leading technical body of that country.

E. P. BOWMAN has resigned from the Topographical Surveys Branch, Department of the Interior, Ottawa, Canada, and has entered private practice in surveying and engineering at Guelph, Ont., where he has taken over the practice of the late D. A. Niven.

G. H. WOOD, formerly on the field staff of the Reclamation Service, Ottawa, Canada, has been transferred to the Ontario division of the Dominion Water Power Branch, with headquarters at Niagara Falls, Ont.

From the Manufacturer's Point of View

A Point of Contact
Between Maker and User of
Construction Equipment and Materials

Hurried Bids Mean High Prices for Equipment

Pump Manufacturer States that, Except for Simple Products, City Specifications Should Receive Month's Study

The following comment on the insufficiency of time generally available to manufacturers for the preparation of bids on equipment comes from a large company prominent in the field of waterworks pumps, whose name is withheld by request. This discussion was prompted by the article by Charles G. Richardson published in "Engineering News-Record" of Nov. 8, 1923, p. 783.

OUR experience in general has been the same as Mr. Richardson's in that the majority of city specifications asking for bids do not allow the manufacturer sufficient time in all cases to prepare the careful estimates and complete propositions which should be made. In general we believe that from three weeks to a month is necessary for preparing bids on specifications which require any amount of study, figuring of prices and engineering work. Of course, where the equipment to be purchased is simple and in accordance with manufacturers' standards this time would probably be too long, but on some negotiations requiring very special equipment and much figuring the time would not be long enough.

Hurried Bids Mean High Prices

An engineer, in fixing a date on which bids will be received, should consider these factors and also that if hurried bids must be prepared they will naturally be made higher than if time is allowed to get together exact costs of all of the equipment to be included in the price. Bids which must be hurriedly prepared also cannot be made complete and as a result time is often lost after the bids have been opened in trying to find out exactly what has been proposed by the various bidders. The straightening out of these details often consumes time even after a contract has been let. All of this time would have been saved had the manufacturer been allowed sufficient time to prepare a proposal in complete detail.

In stating a time on which bids are to be received engineers also seem to lose sight of the fact that every manufacturer receives quite a number of bids for pumping equipment for the smaller and moderate-sized cities, so if only a short time is allowed by each one of these specifications for getting in proposals it means, when they are all taken together, that the necessary time cannot be put on each one. We know of cases where this has resulted in such a wide variety of equipment being offered that the cities could not determine what they should have and rejected the bids. Some manufacturers under these circumstances would object to submitting another bid after their figures had once been disclosed at a public letting.

On larger negotiations there is often a great deal of work to be done in the way of preparing designs, figuring weights of parts, obtaining labor estimates from the shops and so forth, so that in reality a month's time is too short. We have figured here in the past on a city's specification of 500 pages which we know was in preparation for five years, and about three weeks were allowed manufacturers who submitted a bid on this specification.

Specifications Confusing

Another complaint about city specifications not exactly along the lines discussed above is that so much space is devoted to unimportant details and not enough to essentials. We have gone over specifications here which have devoted a paragraph to describing the kind of a clock they wanted in the pumping station and the size of monkey wrenches—and neglected to mention the pumping head. It would also be very helpful if a clear statement of the work to be done by the contractor within definite limits would be placed prominently in the specifications as well as what work will be done by the city so that the bidder would know definitely where his responsibility begins and ends and could make his price accordingly.

In many specifications the work to be furnished is spread all through the specifications and in case the engineer has forgotten anything a clause reading somewhat as follows is added: "The contractor shall furnish everything necessary to make a complete installation whether shown on the plans or mentioned in the specifications or not." Such a clause is very indeterminate as to what may be exacted by the city and naturally means that some contingency item will have to be added.

If some plan could be devised whereby specifications for city work could be drawn up in simple and definite form and sufficient time allowed for preparing bids on these specifications, it would be a forward step which would benefit both the manufacturers and the cities themselves.

We would like to bring up another point which, while not exactly in line with Mr. Richardson's comments, is important. We, as well as all other manufacturers of pumping machinery, seriously object to clauses sometimes included in engineers' specifications with reference to consequential damages and rejection of apparatus. These we consider as unfair to the manufacturers, as they do not represent the equity in a business transaction.

We are heartily in accord with *Engineering News-Record's* efforts to have specifications for city work drawn in simple and definite form, with provisions applicable to both city and the bidder and also allowing considerable time for the preparation of bids.

Warren Bros. Lose Paving Patent Suit

On Appeal, Claim of Infringement on California Construction Is Denied by Court

ANOTHER court decision adverse to the paving patent claims of Warren Bros. Co., Boston, was rendered last month.

The case involved certain bituminous road construction in Fresno County, Calif., by Thompson Bros., contractors. On this work it was claimed by the Warren Co. that its Wallace patent (No. 959,976) for two-course bituminous construction, "blended and bonded into a compact layer densest at the top," was being infringed. Previously, on May 29, 1922, the U. S. District Court of Los Angeles decided against the Warren claims, and the case was appealed. The decision of the lower court, however, has just been affirmed by the U. S. District Court of Appeals in an opinion filed Dec. 3 by Judge Gilbert. The decision of the lower court was published, in full, in *Engineering News-Record* of June 15, 1922, p. 992.

On the Fresno County pavement construction the contractors departed from the process described in the Wallace patents by rolling the lower layer of bituminous material before placing the upper layer thereon. In the description of the Wallace process the upper and lower layers are "blended" without any intermediate compression of the lower layer.

In its opinion, the Court of Appeals said, in part: "We cannot assent to the proposition that the appellant (Warren Bros.) has by its patent obtained the exclusive right to make a pavement in which the two upper layers are blended, irrespective of the process by which the blending is accomplished. The appellant accomplishes that result by superimposing the top layer upon the lower layer without having first rolled the latter and by taking advantage of its uncompressed condition and applying a heavy roller thereto. The appellees (Thompson Bros.) accomplish their result by rolling and heating the lower layer before placing and rolling the upper layer thereon. In so doing they depart in no substantial degree from the methods known and used in the prior art and which were free to all to use."

Motor Vehicle Production and Registration During 1923

Preliminary figures issued by the National Automobile Chamber of Commerce indicate a total production of motor cars and trucks during 1923 of 4,014,000; of this number, 3,644,000 were passenger automobiles and 370,000 motor trucks. The previous record motor vehicle production was in 1922 when 2,659,064 cars and trucks were manufactured.

At the end of the year, approximately 14,500,000 motor vehicles were registered in the United States, of which 12,880,000 were passenger automobiles and 1,620,000 motor trucks. The world registration of motor vehicles for the year 1923, according to the National Automobile Chamber, was 17,000,000, thus giving the United States 85 per cent of the world's motor vehicle registration.

Organize Big Company to Reconstruct Tokyo

American-Japanese Corporation Will Finance Construction and Import Equipment and Materials

A BUILDING construction company is now being projected in Tokyo for the purpose of undertaking "to do civil engineering, construction work and to give loans to building contractors for construction expenses and also to import materials from foreign countries to supply the demand," according to a tentative prospectus received by the Far Eastern Division of the Bureau of Foreign and Domestic Commerce from its representative at Tokyo. Technical skill, machinery, and building materials needed in carrying out the plans of the corporation are to be secured in the United States according to present plans.

The new corporation will be known as the "Nichi-Bei Doboku Kabushiki Kaisha" or "Japanese-American Engineers' and Contractors' Corporation" and will be financed and controlled jointly by Americans and Japanese. Head offices will be established in Tokyo with branches in other parts of Japan as may be deemed necessary. The corporation is to be capitalized at 100,000,000 yen ($50,000,000), half of which amount, according to present plans, will be called into the treasury of the company when incorporation is actually effected. Stock certificates are to be issued in denominations of 10, 50, 100, and 1,000 yen and will be printed in both English and Japanese. The shares will be divided equally between Japanese and American citizens it is said, insuring joint control of the venture.

This project differs from the original company planned in that it proposes not only to participate in the work of construction throughout the devastated area but to undertake to carry out building projects in other parts of Japan and the Far East and to engage in the importing business.

Gypsum Merger Pending

A report was current last week to the effect that there had been an amalgamation of the U. S. Gypsum Co., Chicago, and J. B. King & Co., New York, one of the leading firms in the plaster business in the East. Inquiry at the offices of the King company elicited the reply that while negotiations between the two organizations were in progress the announcement of an amalgamation "was premature."

Business Notes

BAY CITY DREDGE WORKS, Bay City, Mich., have established an Eastern sales office at 302 Broadway, New York, in charge of E. P. Reading. A branch office also has been opened in Boston (51 Ames Building), in charge of Thomas D. Connolly.

DORR CO., New York, has discontinued its office in Joplin, Mo. All future work of this office will be carried on by the company's Denver office.

BULLDOG FLOOR CLIP CO., Winterset, Iowa, of which C. W. Prickett is president and general manager, and W. C. Krabiel is secretary and treasurer, announces that after a long period of litigation with the Munson Manufacturing Co., maker of the Griptite floor anchor, the examiner of interferences of the U. S. Patent Office has rendered a decision awarding to Clyde W. Prickett priority of invention for his process of laying wooden floors on a concrete base and also for his concrete and wood floor construction device. The latter is a metal clip embedded in concrete floors before the concrete hardens for the purpose of securing wooden strips to which the flooring is nailed.

CHAIN BELT CO., Milwaukee, has established direct factory branches and warehouses in San Francisco and Los Angeles. G. E. Taylor is the new district manager at San Francisco and J. V. McDonald at Los Angeles. Similar branches and warehouses have been put into operation in Spokane, Seattle and Portland.

EASTERN PAVING BRICK MANUFACTURERS ASSOCIATION, Philadelphia, announces the appointment of Irvin S. Badger as northern district engineer, with headquarters in Syracuse, N. Y. Mr. Badger received his engineering training in Syracuse University and has been engaged in engineering work for 15 years, the last three being in charge of road construction for the New York State Highway Department.

Equipment and Materials

Expanded Wood Lath

For plastering and stucco work where wood is permissible as a base there is being introduced an expanded wood lathing, furnished by the Expanded Wood Lath Corp., Chicago. By special machinery the wood is slit and expanded to form longitudinal strips $\frac{5}{16}$ in thick, connected by diagonal ribs. These ribs are narrower than the strips, so that the plaster passes around them and is thus keyed in place. The material is furnished in sheets 16 x 48 in., backed with waterproof asphaltic felt.

For exterior work it may be applied directly to the studding without the use of sheathing, and when plastered it forms a stucco slab. In laboratory tension tests of panels 4 x 8 ft. a panel with expanded wood lath on both sides showed a deflection of 0.06 in. at 200 lb. and 0.92 in. at 1,500 lb., while in the case of a panel having one side sheathed and the other covered with common lath the deflection was the same at 200 lb. but increased to 5.13 in. at 1,500 lb.

Magnetos for Single-Cylinder Gasoline Engines

Novo Engine Co., Lansing, Mich., has just announced that on all of its single-cylinder engines Wico high-tension magnetos will be used as standard equipment. Heretofore magneto ignition on the company's single-cylinder power units was optional, barrage ignition (battery and coil) being standard. The new magneto equipment, the manufacturer claims, requires practically no attention other than oiling and is not affected by climatic changes.

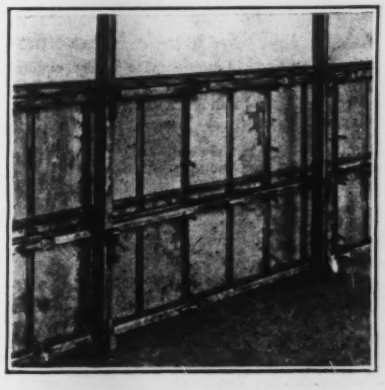
Power Shovel Crawls Along River Bottom to Reach Job

Time required for dismantling and re-assembling a power shovel for delivery to the dam construction job of the Dells Paper & Pulp Co., Eau Claire, Wis., was saved by forcing the machine to make a ¼-mile trip under its own power along a river bottom. To permit the pouring of concrete before winter arrived the shovel was needed in a hurry to excavate within a cofferdam. At this point there are high bluffs on each side of the river, making impossible the delivery of heavy equipment except by knocking down and lowering a distance of 70 or 80 ft. by derricks.

As an alternative the manufacturer of the shovel, the Pawling & Harnischfeger Co., Milwaukee, suggested that the machine, which weighed 22 tons and was mounted on crawler treads, could be run into the river about a quarter of a mile below the dam and moved under its own power to the cofferdam. This proposal was put into effect and although the river bed was uneven and water rose, at times, almost to the level of the magneto and carburetor of the gasoline engine, the trip was successfully negotiated in 5½ hr. On reaching the site of the work the shovel emerged from the river, crawled over the cofferdam and down into the hole 12 ft. below, where it began immediately the work of excavation formerly handled by a large gang of hand shovelers.

Aligner Clamp for Steel Forms

For handling a number of standard steel wall form plates as a unit the Metal Forms Corporation, Milwaukee, has perfected a clamp for attachment to either wood or standard adjustable steel aligners. With this device, shown in the accompanying illustration, one contractor recently moved 104 standard 24x24-in. wall form units in one lift.



Business Side of Construction

FACTS AND EVENTS THAT AFFECT COST AND VOLUME

Production and Materials Stocks in Eight Cities

Steel, Lumber and Cement Output Gained in 1923—Iron, Heaviest on Record—Limited Supply of Brick

Iron—The 1923 pig-iron output was the heaviest on record with over 40,000,000 tons as against slightly over 26,000,000, during the preceding year. The 1923 tonnage was over 11 per cent greater than the output for the peak year 1920.

Steel—The production of steel ingots during 1923 gained 41 per cent over the preceding year, according to records of the American Iron and Steel Institute. The year 1923 showed a total of 41,216,902 tons, against 29,116,453 in 1922. At no time during the last year did production fall below the 2,000,000 tons per month mark, while in 1922 the lowest monthly output was 1,593,482 tons, reached in January of that year. The output for May, 1923, was in excess of 4,000,000 tons; the highest monthly total reached in 1922 was 2,889,297 tons, in November of that year. Production by months for the last two years is given as follows:

	1923 Tons	1922 Tons
Jan.	3,644,629	1,593,482
Feb.	3,294,264	1,745,022
Mar.	3,858,675	2,370,751
Apr.	3,760,997	2,444,513
May	4,000,695	2,711,141
June	3,574,567	2,634,477
July	3,350,829	2,487,104
Aug.	3,506,755	2,214,582
Sept.	3,161,964	2,373,779
Oct.	3,382,986	2,872,415
Nov.	2,969,012	2,889,297
Dec.	2,711,529	2,779,890
Total	41,216,902	29,116,453

Unfilled orders on books of the U. S. Steel Corporations, Dec. 31, 1923, totaled 4,445,339 tons, against 6,745,703 tons on Dec. 31, 1922. These figures would indicate either a lessening of demand or increased production during 1923. Unfilled tonnages at the end of each month during the last two years, follow:

	1923 Tons	1922 Tons
Jan.	6,910,776	4,241,678
Feb.	7,283,989	4,141,069
Mar.	7,403,332	4,494,148
Apr.	7,288,509	5,096,917
May	6,981,351	5,254,228
June	6,386,261	5,635,531
July	5,910,763	5,776,161
Aug.	5,414,663	5,950,105
Sept.	5,035,750	6,691,607
Oct.	4,672,825	6,902,287
Nov.	4,368,584	6,840,242
Dec.	4,445,339	6,745,703

Lumber—Sharp decreases in production, shipments and orders marked the closing weeks of the year 1923. This falling off is partly accounted for by the holidays and partly by the fact that at this season many mills are shut down for repairs and the taking of inventory. According to the National Lumber Manufacturers' Association, the lumber movement for 1923, compared with preceding years, was as follows:

	Production Ft. B. M.	Shipments Ft. B. M.	Orders Ft. B. M.
1923	12,423,297,357	12,332,086,108	11,824,075,216
1922	11,007,176,018	10,714,492,405	10,978,771,583
1921	8,158,524,537	8,237,039,837	8,069,820,794
1920	10,397,901,997	9,358,087,452	7,926,129,874

Brick—The present demand for brick is unprecedented for this season of the year. Orders on books as of Dec. 1 according to the Common Brick Manufacturers' Association of America, totaled 276,124,000, against 229,225,000 for the corresponding month in 1922. Burned brick on hand numbered 334,381,000. Dec. 1, 1923, compared with 238,858,000 on the first of December of the preceding year. With the volume of orders on books nearly 47,000,000 in excess of a year ago, the quantity of unsold brick on hand represents a limited supply of material with which to enter the new year.

Cement—Total production for 1923 reached 137,377,000 bbl., the heaviest on record, compared with 114,789,984 bbl. during the preceding year. Shipments from mills also reached the record total of 135,887,000 bbl. during 1923, against 117,701,216 for the year preceding. Owing to the slight excess of production over shipments, mill stocks are piling up as usual during this season of the year. The reserve available at mills throughout the country, Jan. 1, totaled 10,581,000 bbl., against 9,108,000, one year ago. Next month, however, the spring demand will begin to eat into the reserve if the trend observed in previous years is followed.

Local conditions affecting materials stocks in eight important centers, taken in a zig-zag line across the continent, are as follows:

San Francisco—With the exception of structural rivets, which are usually kept in small quantities at warehouses, all building materials are plentiful and easily obtainable from mills.

Denver — Common brick stocks dropped 4,000,000 in one month. Sewer pipe supply barely keeping up with orders. Other materials adequate to demand.

Minneapolis—Lumber stocks in Twin Cities about 20 per cent below month ago, but sufficient to meet current needs. There is considerable buying activity among lumber dealers for replenishment of depleted stocks.

Detroit—Dealers' yards and warehouses are well stocked with all construction materials except large structural timbers, paving bricks and hollow building tile. On the last mentioned item, mill deliveries require several days.

Cincinnati—With the exception of small warehouse stocks of structural steel maintained durning the recent inventory period, all other construction materials are plentiful.

CONDITIONS OF MATERIALS STOCKS IN IMPORTANT CENTERS

Stocks on hand in approximate figures, example: (Common brick, Denver, 5,000,000); time required for delivery of carload lots to city job, example: (Hollow tile, Detroit, deliveries take several days); and stocks on hand in general terms, example: (Sewer pipe, Cincinnati, plenty.)

	San Francisco	Denver	Minneapolis	Detroit	Cincinnati	New Orleans	Philadelphia	New York
Sewer pipe	Stocks in usual good condition	Barely keeping up with orders	Ample	Moderate stocks in local yards	Plenty	Fair; demand light	Stocks low	Scarcity in sizes 24-in. and over
Cement	Fairly well supplied	Enough	Plenty in local warehouses	Nearby mills	Large stocks	Plenty; small demand	Adequate	Plenty; dealers' stocks small but mill del. prompt
Lime	Stocks in fair shape	Sufficient	Enough	Dealers' warehouses well stocked	Sufficient to meet demand	Ample	Plenty	Market well supplied
Common brick	Dealers' stocks in good shape	5,000,000	Plenty in local yards	Plenty in local yards	Enough	Sufficient	Enough in local yards	Over 41,000,000; no possibility of shortage before April
Hollow tile	Large reserves	Stocks low	Del. on short notice from nearby plants	Small reserve; del. takes several days	Ample	Enough	Stocks small; del. good	Supply good; water deliveries prompt
Lumber	Plenty fir	15,000,000 ft.	About 20 per cent below month ago	Stocks ample; except large timbers	Plenty	Not much pine on hand	Meeting all present demands	Short mill stocks; brisk demand
Asphalt	Very large native reserves	Sufficient	Enough	.....	Kentucky Rock plentiful	No market	No stocks in city	Heavy reserves in N. J.
Structural steel	Bars easily obtainable from local mills; fair stocks of shapes in warehouses	Warehouses well stocked	Warehouse stocks ample	.....	Smallness of stocks during inventory period consistent with demand	Fair; demand light	Shipped from mill as needed; jobbers stocking up	Jobbers stocks low; replenishment in progress

New Orleans—Lumber mill stocks are low. Most mills are closing down for the annual season of repairs. All other materials ample.

Philadelphia—Cement, sewer pipe, hollow tile, asphalt and structural steel appear to be the only materials in which there is any sign of scarcity at warehouses. Mill deliveries, however, are good and jobbers are replenishing.

New York — Dealers' warehouse stocks are necessarily limited, but with plenty of cars, mill deliveries are sufficiently prompt. There has been a scarcity for some months past in sewer pipe in sizes above 24-in. The 41,000,000 brick now being held in winter reserve will serve to offset all chances of shortage until April.

Foreign Projects of Interest to Americans

A number of foreign construction projects which should be of interest to American engineers, contractors and manufacturers has been reported by the United States Department of Commerce. They are noted here, further information being available at the Bureau of Foreign and Domestic Commerce or its district co-operative offices, when a reference number is given.

Marble plant — Company in South America plans extension of plant. The plan is in charge of an American expert and it is reported that orders for American stone working machinery will be placed soon. Reference No. 114062.

Bridge—Construction of North Shore Bridge, Sydney. This is the greatest engineering enterprise of its kind yet undertaken in Australia. About 60,000 tons of steel will be required for the making of the bridge of which Australia can provide about 13,000 tons. The remainder cannot yet be produced in Australia. (Trade Commissioner J. W. Sanger, Melbourne, Australia.)

Waterway improvement—The deepening of an old waterway in Colombia, part artificial and part natural, to a minimum depth of 8 feet and a minimum width of 146 feet throughout a length of about 129 miles will be necessary. Reference No. 115046.

Subway—Rome subway project information now available at New York district office, 734 Customhouse.

Municipal improvements in Pernambuco. A city in the state of Pernambuco plans the erection of a moving picture theatre, electric lighting system, and motor bus service. Reference No. 115437.

Grain elevators to be constructed in Manchuria. The South Manchuria Railway Company is considering the erection of elevators at Darein, Changchun, and Kaiyuan. Manchuria has a great future as a grain producing country. (Consul J. W. Ballantine, Darein, Manchuria.

Mills — Two mining companies of Canada to build mills. One with a 500 ton daily capacity, the other with a 400 ton capacity. They will be on the market for gold-ore handling and refining equipment. Reference No. 116541.

Pulp plant — Lumber Company of British Colombia plans new sulphite pulp plant. The Canadian interests have been purchased by American capitalists and opportunities for the sale of American machinery will develop. Reference No. 116231.

Business Briefs

For the first week of the new year, money was very plentiful and interest rates low.

Call money rates were 4@3¾ per cent.

Time loan charges stood at 4¾@5 per cent.

Commercial paper rates 4¾@5 per cent.

Foreign exchange lower. Sterling, $4.31⅝; prev. week, $4.32⅝; year ago, $4.68¼. Franc, $0.0501½; prev. week $0.0512; year ago, $0.0707. Lira, $0.0439½; prev. week, $0.0432½; year ago, $0.0502½.

Lumber Waste in U. S. 140 Million Feet Annually

An annual waste of 140,000,000 feet of lumber in the United States is reported by a special committee of the Consulting Committee on Lumber Standards to the National Lumber Manufacturers' Association. The average annual growth of 2,000,000 acres, covering an area equal to one-half of New Jersey is represented in this waste. The cause of this enormous waste is due to the public demanding lumber cut to even lengths. This committee analyzed 310 house plans and where the consumer demanded even lengths, fifty per cent of the purchased joists were sawed into odd lengths. The output of six mills was studied and the waste due to even length requirements amounted to 7.29 per cent of which 1.27 per cent was unnecessary waste. It is recommended that odd dimensions be added to the even sizes now manufactured and that the consumer and builders co-operate in this movement of lumber saving.

What Lumber Is Used For

The National Lumber Manufacturers Association in a recent bulletin published information on the above heading. According to the Forest Products Laboratory, softwood lumber is composed of about 85 per cent yard lumber, 12 per cent timber and 3 per cent shop or factory lumber. The laboratory usually makes a classification of all lumber as follows, basing their figures upon the 1920 lumber census:

Softwood yard lumber	69.2	per cent
Structural timbers	9.7	" "
Softwood factory lumber	2.4	" "
Hardwoods	18.7	" "
Total	100.0	" "

In the case of softwood yard lumber, the laboratory has made the following divisions and figured the given percentages.

	Percentage of total softwood yard lumber	
Finishing, casing, base and moulding	7.3	per cent
Flooring	8.0	" "
Ceiling and partition	2.7	" "
Siding	6.3	" "
Common boards (including fencing)	50.3	" "
Dimension	24.3	" "
Factory flooring, etc.	1.1	" "
Total	100.0	" "

It is estimated that about 80 per cent of the hardwood is factory lumber; 15 per cent is cut into such forms as timbers, sawed ties or bridge planking, and 5 per cent is sold as yard lumber.

Bids Wanted on Big Jobs

Among the projects on which bids are either asked or will soon be called for, in Construction News, pp. 29 to 41, are the following:

Mill, Portland, Ore., Portland Pulp and Paper Co., $1,200,000.

Pier, Baltimore, Md., Baltimore & Ohio R.R., $1,500,000.

Grading, curbing and paving, Cleveland, O., $2,500,000.

Assembly Plant, Memphis, Tenn., Ford Motor Co., Detroit, Mich.

Assembly Plant, Louisville, Ky., Ford Motor Co.

Welland Ship Canal, St. Catherines, Ont., Dept. Rys. and Canals, $5,000,000 to $8,000,000.

Paving, Indiana, State Hy. Dept., Indianapolis, $1,000,000.

Large Contracts Let During Week

Among the week's announcements of contracts awarded in Construction News, pp. 29 to 41, are the following:

Plant, Charlotte, N. C., to McDevitt-Fleming Co., Detroit, Mich., $1,000,000.

Drainage, Charleston, Miss., to N. C. McGinnis & Co., $1,500,000.

Hotel and Theatre, Boston, Mass., to Olympia Constr. Co., $8,500,000.

Printing Plant, Philadelphia, Pa., to Doyle & Co., $2,500,000.

Hotel, Atlanta, Ga., Henry Grady Hotel Co., to Gude & Co.

Apprenticeship Program Formulated

A national program on apprenticeship for the construction industry was recently launched by the Apprenticeship Committee of the American Construction Council. This Committee, states the *National Lumber Bulletin*, is composed of representatives of all elements of the construction industry throughout the country, including employers, manufacturers and professional bodies, as well as the various trades and crafts representing labor. Forty persons, representing all of these groups, including the National Lumber Manufacturers Association, were in attendance.

A national survey of the apprenticeship needs and distribution of labor in the construction industry was authorized and instructed to be carried out as the first essential in the program. Exhaustive study of instructional facilities and standards for apprentice training throughout the country in the construction crafts was also especially provided for.

Wages of French Concrete Workers

The following table shows the current wage scale for skilled labor in the reinforced-concrete construction industry in France as of Nov. 30, 1923. It is by the mark to value the franc at the present dollar exchange rate since the Frenchman earning French money expends it at the French scale, depreciated though the paper francs are to less than one-third of their gold value.

	Francs
Laborers, per hour	2 to 4
	Per Month
Framers and molders	700 to 900
Foremen	700 to 900
Contractors representative	1,000 to 1,800
Draughtsmen	900 to 1,200
Tracers	400 to 500
Engineers	500 to 1,800
Clerk of the works	1,200 to 2,000
Bookkeepers	800 to 1,200
Assistant bookkeepers	500 to 800
Stenographers	350 to 600

Mercantile Failures in 1923

Business failures during 1923 have been somewhat lighter than in either of the two preceding years but are still very heavy. Mercantile defaults for 1923, as shown by the records of R. G. Dun & Co. number 18,718 and the liabilities amount to $539,386,806. During 1922 there were 23,676 defaults, the largest number ever recorded in a single year, and the liabilities were $623,896,251, next to the largest amount involved in any one year; the failures during 1921, the preceding year, being a few million dollars in excess of those reported for 1922.

Both in number and amount of indebtedness the figures for the past three years have run very high. The records of business failures compiled by R. G. Dun & Co. go back nearly seventy years. The number of concerns in business is now greater than ever before and this would account for a part of the increase in the number of business failures. Below is given the number of failures and the amount of liabilities for each year back to 1910:

	Number	Liabilities
1923	18,718	$539,386,806
1922	23,676	623,896,251
1921	19,652	627,401,883
1920	8,881	295,121,805
1919	6,451	113,291,237
1918	9,982	163,019,979
1917	13,855	182,441,371
1916	16,993	196,212,256
1915	22,156	302,286,148
1914	18,280	357,908,859
1913	16,037	272,672,288
1912	15,452	263,117,391
1911	13,441	191,061,665
1910	12,652	201,757,097

Weekly Construction Market

THIS limited price list is published weekly for the purpose of giving current prices on the principal construction materials and of noting important price changes on the less important materials. Moreover, only the chief cities are quoted.

Valuable suggestions on costs of work can be had by noting actual biddings as reported in our Construction News section.

The first issue of each month carries complete quotations for all construction materials and for the important cities. The last complete list will be found in the issue of Jan. 3; the next, on Feb. 7.

Steel Products:	New York	Atlanta	Dallas	Chicago	Minneapolis	Denver	San Francisco	Seattle	Montreal
Structural shapes, 100 lb.	$3.64	$4.00	$4.40	$3.30	$3.55	$4.20	$3.60	$3.85	$4.25
Structural rivets, 100 lb.	4.40	4.75	4.90	3.75	4.00	5.30	5.00	4.05	6.00
Reinforcing bars, ¾ in. up, 100 lb.	3.54	3.50	3.38	3.20	3.45	3.85	3.65	4.25	4.00
Steel pipe, black, 2½ to 6 in. lap, discount	44%	40%	43%	47%	53–5%	36%	37.10@47.40%	35%	47.43
Cast-iron pipe, 6 in. and over, ton	61.60@63.60	54.75	61.00	57.20@60.20	60.50	67.00	57.00	62.00	60.00
Concreting Material:									
Cement without bags, bbl.	2.50@2.60	2.35	2.05	2.10	2.42	2.84	2.61	2.90	2.25
Gravel, ¾ in., cu.yd.	2.00	1.75	2.38	2.00	1.85	1.90	2.15	1.25	1.50
Sand, cu.yd.	1.25	1.20	2.00	2.00	1.25@1.50	1.00	1.50	1.25	1.25
Crushed stone, ¾ in., cu.yd.	1.75	1.90	2.83	2.00	2.00	3.50	2.15	3.00	1.90
Miscellaneous:									
Pine, 3x12 to 12x12, 20 ft. and under, M.ft.	+63.00	37.00	54.75	55.50	44.75@46.00	+57.00	38.00	30.00	65.00
Lime, finishing, hydrated, ton	18.20	23.00	20.00	20.00	25.50	24.00	22.00	24.00	21.00
Lime common, lump, per bbl.	3.00@3.25	1.50	1.85	1.50	1.50	2.70	2.10	2.80	9.50
Common brick, delivered, 1,000	23.65	11.00	11.60	11.00	16@18	12.00	15.50	15.00	16.50
Hollow building tile, 4x12x12, per block	Not used	.10	.11	.0724	.075	.065	.....	.11	.115
Hollow partition tile 4x12x12, per block	.1179	.10	.11	.....	.....	.065	.108	.11	.....
Linseed oil, raw, 5 bbl. lots, gal.	—.94	—.96	1.07	.94	1.01	1.10	1.03	1.15	1.38
Common Labor:									
Common labor, union, hour	.75	.30	.....	.....	.....	.50@.55	.55	.62½	.....
Common labor, non-union, hour	....	.25	.30@.50	.82½	.40@.45	.35@.50	.50	.62½	.30

Explanation of Prices—Prices are to contractors in carload lots unless other quantities are specified. Increases or decreases from previous quotations are indicated by + or — signs. For steel pipe, the prevailing discount from list price is given; 45-5% means a discount of 45 and 5 per cent. Charge is 15c. per 100 lb. for cutting reinforced steel into 2-ft. lengths or over.

New York quotations delivered, except sand, gravel and crushed stone, alongside dock; common lump lime, in 280-lb. bbl. net, and hydrated lime f.o.b. cars; tile "on trucks"; linseed oil and cast-iron pipe f.o.b.

Labor—Concrete laborers' rate, 93½c.; building laborers (pick and shovel men) 75c. per hr.

Chicago quotes hydrated lime in 50-lb. bags; common lump lime per 180-lb. net. Lumber delivered on job.

Minneapolis quotes on fir instead of pine. Brick, sand and hollow tile delivered. Cement on cars. Gravel and crushed stone quoted at pit. We quote on brown lime per 180-lb. net; white is $1.80 for Kelly Island and $1.70 for Sheboygan. Common labor not organized.

Denver quotes on fir instead of pine. Cement "on tracks"; gravel and sand at pit; stone on cars; lime, brick, hollow tile and lumber on job. Tile price is at warehouse. Linseed oil, delivered, in iron bbl. Common lump lime per 180-lb. net.

Atlanta quotes sand, stone and gravel per ton instead of cu.yd. Common lump lime per 180-lb. net.

Dallas quotes lime per 180-lb. bbl. Steel, cement, cast-iron pipe and crushed stone f.o.b. cars, other materials delivered.

San Francisco quotes on Heath tile, size 5½ x 8 x 11½. Prices are all f.o.b. warehouses except C. I. pipe, which is mill price plus freight to railway depot at any terminal. Common lump lime per 180-lb. net. Lumber prices are to dealers in yards at San Francisco, for No. 1 fir, common.

Seattle quotes on Douglas fir (delivered) instead of pine. Lump finishing lime per 180-lb. net. Hollow building tile delivered. Hydrated lime in paper sacks. Sand and gravel at bunkers.

Montreal quotes on Douglas fir instead of pine. Sand, stone, gravel and lump lime per ton. Cement, lime and tile are delivered; sand, gravel and stone on siding; brick f.o.b. plant; steel and pipe at warehouse. Hollow tile per ft. Cement price is in Canadian funds (the Canadian dollar stands at 97.32). Bag charge is 80c. per bbl. Discount of 10c. per bbl. for payment within 20 days from date of shipment. Steel pipe per 100 ft. net; 3-in., $47.43; 6-in. $119.

Weekly Review of the Market

The money value of large commercial and industrial building contracts represented over 56 per cent of the total value of all construction during 1923, according to *Engineering News-Record*. This fact, together with the increasing volume of building permits now being issued, points to a continuation of employment in the building trades during 1924.

Although general business is a trifle slower than a year ago, there exists none of that tendency to over-stock so noticeable during the first part of 1923. Buying of materials is limited at present to actual needs and the price situation is one of few changes.

Lumber, however, shows a marked upward tendency at certain points. Pine timbers advanced $3 in New York and Douglas fir, $1 to $7 per M ft. in Denver since last week. Red and white lead rose ¼c. per lb. in New York, Jan. 8, while linseed oil dropped 1c. per gal. during the week of Jan. 3, 1924.

The iron and steel situation, briefly outlined, is as follows: Pig-iron demand developing slowly; confined at present to the Northeastern states. Steel prices holding firmly to $2.40 base for bars and $2.50 per 100 lb. for plates and shapes, f.o.b. mill. Wrought-steel and cast-iron pipe demand fairly active. Improvement in buying of steel sheets due mostly to automotive requirements. Business good in semi-finished steel.